AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

NOVEMBER 1, 1941

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The Automobile

Reg. U. S. Pat. Off.
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IN THIS ISSUE . . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 85 November 1, 1941 Number 9

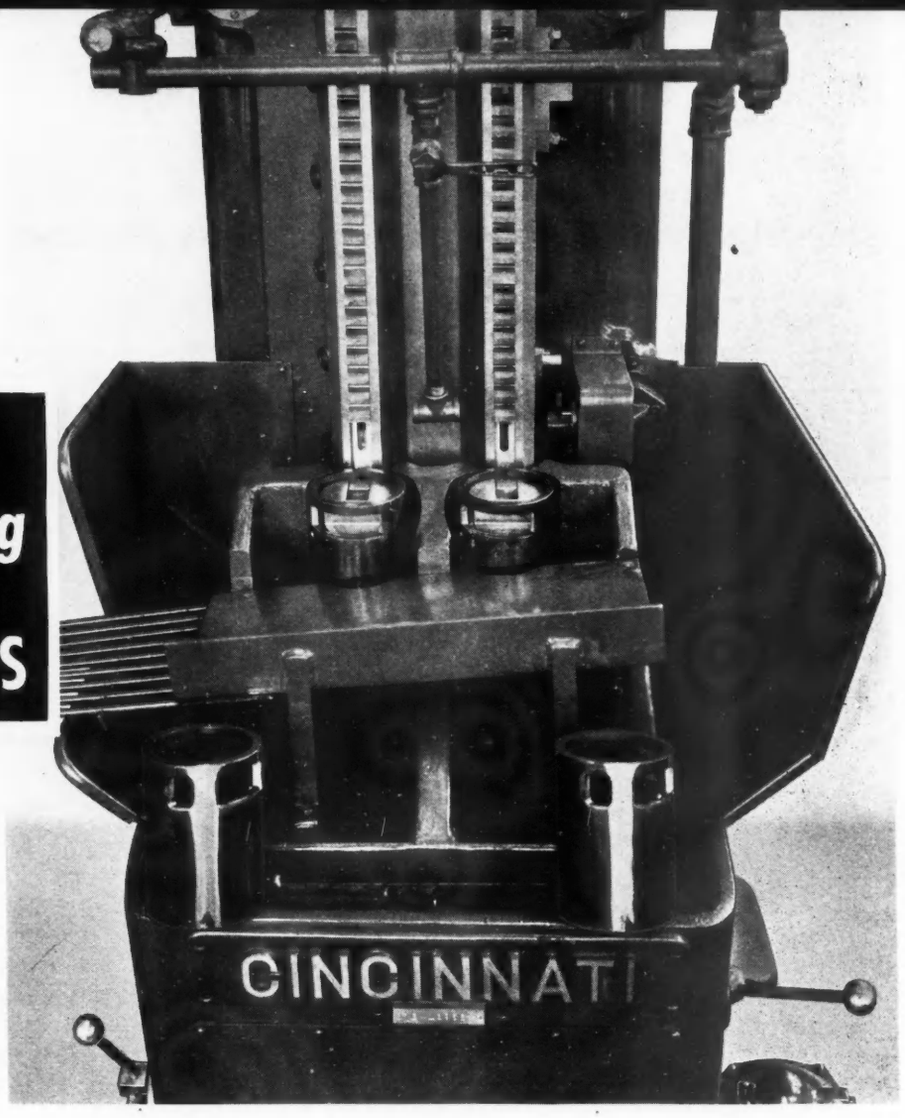
Defense Plants Train WPA Workers for Jobs

An in-plant training program, whereby the Work Projects Administration seeks to accelerate private employment of those on its rolls, enables selected workers to be placed in defense industries for plant-supervised training on specific jobs. In three months since its inauguration, more than 250 plants in 72 cities and 24 states have been authorized to use the plan, with final placement of WPA trainees averaging 95 per cent. These plants are producing aircraft, arms, diesel engines, tools, instruments, brass products and other defense equipment and materials.

Under the new program, skilled and semi-skilled workers and those with mechanical aptitudes are referred directly to defense industries suffering from labor shortages, given a period of short, objective training under shop foremen and technicians and transferred to the employers' payroll provided they have acquired the necessary minimum skill. Trainees' wages are paid by WPA up to 160 hours or four weeks, at rates paid learners in the identical plants.

CINCINNATI

BROACH ~~Hand~~ Snagging IN 6½ SECONDS



REMEMBER the last time you went through a foundry cleaning room while it was running full blast, and how glad you were to get out again? The hand snagging operations which you saw—and avoided as much as possible—are just as disagreeable as they look; and expensive, too.

Removing the flash formed during a welding operation by the usual snagging operation is just as bad. A manufacturer of generators solved the problem of removing the weld flash on generator frames by broaching it off on a CINCINNATI No. 5-42 Single Ram Vertical Hydro-Broach Machine. The job is cleaner, more uniform, better finish, and it *requires only 6½ seconds per piece.* (570 per hour.)

Why not investigate now the possibilities of money saving broaching operations on CINCINNATI equipment? Built in Single Ram Vertical, Duplex (double ram) Vertical, and Horizontal types, and many sizes of each, covering any surface broaching problem that may arise. Write for literature. The Cincinnati Milling Machine Co., Cincinnati, Ohio, U. S. A.

THE CINCINNATI MILLING MACHINE CO.
Cincinnati, Ohio, U. S. A.

AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

Vol. 85, No. 9
November 1, 1941

Unemployment Grows

In Automotive Industry's Transition From Peace Time to Defense Production

By E. L. WARNER, JR.

UNEMPLOYMENT in the midst of a record industrial boom. That is the paradoxical situation facing the automobile industry as it goes through the throes of transition from a peace-time to a war-time economy. While the index of industrial production reaches new high levels, surpassing even 1937 and 1929, surveys indicate that more than 100,000 automotive workers will be idle in Michigan alone by next Jan. 1.

Government, industry and the military services all have been blamed for this dislocation of labor. However, it appears to be an unavoidable concomitant when an unprepared democracy changes over from the production of peace-time consumer goods to instruments of death and destruction. Civilian needs must be subordinated and often go unfilled in order that the productive facilities and the raw materials may be made available for national defense.

The government deems the curtailment of passenger car production necessary in order to conserve vital raw materials like steel, copper, rubber, nickel and chrome. The total cut for the first six months of the 1942 model year through January, 1942, amounts to 36.3 per cent, but under the plan worked out by OPM, this increases in severity. Thus, the December and January quotas are cut 48.3 and 51.1 per cent, respectively, under the passenger car output for the same months of the previous year, while succeeding months will see even a greater reduction.

It had been the hope of the government that growing defense orders would take up this slack in non-defense employment. In fact last spring, before the raw material shortages were apparent, it seemed likely that there would be an actual scarcity of labor in Michigan and especially Detroit. Automobile curtailment has dispelled any fears of a labor shortage, except in certain highly skilled classifications, such as tool and die makers, machinists and machine shop foremen. Now the problem is to find defense jobs for all prospective unemployed automotive workers.

Industry, labor and OPM officials have held numerous joint sessions in the last two months in an effort to cushion the shock of this temporary unemployment. A seven-point program for the orderly transfer of workers from non-defense to defense production already has been drawn up in such conferences and an agreement has been signed by General Motors and the UAW-CIO to put this program into effect. This program is designed to expedite defense production, maintain employe morale and to reduce migration of workers between plants and communities. Employes retain their seniority when transferring from non-defense to defense jobs and are permitted to seek positions in defense plants when non-defense work is declining.

Three methods for alleviating the unemployment problem faced by the automotive industry present themeslves. An increase in defense orders placed with automotive manufacturing, parts and body plants is imperative if employes are not to remain idle. Non-defense production can be spread among more workers by decreasing the work week from 40 to 32 hours, as provided in union contracts. Defense production can be spread among more workers by accelerating work in such plants to a three and four-shift basis.

Defense and Non-Defense Employment

Estimates of defense and non-defense employment in Michigan plants as submitted to Tolan Committee hearing in Detroit, September 18, 1941.

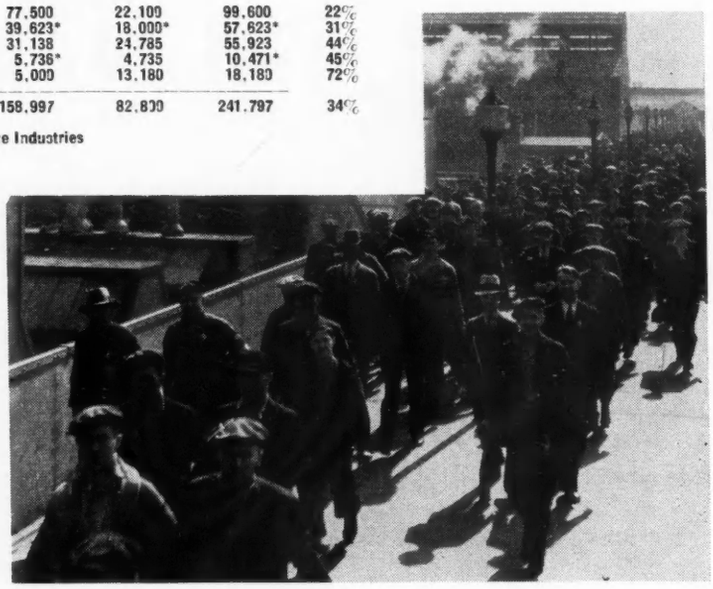
	Non-defense	Defense	Total	Percent on Defense
June 30, 1941 (Actual employment)				
General Motors	125,259	11,919	137,178	8%
Ford	93,231*	3,000*	96,261	3%
Chrysler	55,729	11,292	67,021	17%
Hudson	7,877	478	8,355	6%
Packard	7,010	4,647	11,657	40%
Totals	239,133	31,383	320,472	10%
October 31, 1941				
General Motors	108,200	21,820	130,020	16%
Ford	79,139	8,800	87,939	10%
Chrysler	46,699	18,061	64,760	28%
Hudson	6,749	2,520	9,269	27%
Packard†	7,319	6,721	14,040	48%
†Employment Sept. 20	248,105	57,922	306,028	19%
December 31, 1941				
General Motors	82,200	24,400	106,600	23%
Ford	46,616	13,500	60,116	22%
Chrysler	32,317	20,090	52,407	38%
Hudson	6,749	3,674	10,423	35%
Packard	7,300	10,300	17,600	58%
Totals	175,182	71,934	247,146	29%
March 31, 1942				
General Motors	77,500	22,100	99,600	22%
Ford	39,623*	18,000*	57,623*	31%
Chrysler	31,138	24,785	55,923	44%
Hudson	5,736*	4,735	10,471*	45%
Packard	5,000	13,180	18,180	72%
Totals	158,997	82,800	241,797	34%

* Estimated by Automotive Industries

edgment that a long make-ready period must elapse before dollars in a government order can be translated into the finished materials of war.

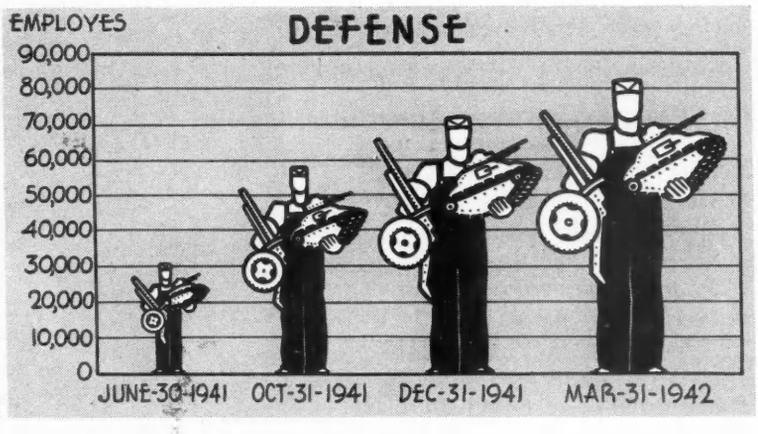
Packard began preparing facilities for the manufacture of Rolls-Royce aircraft engines in July, 1940, but it was not until August, 1941, that the first production engine came off the line and even then only about 5,000 of the contemplated peak employment of 17,800 workers were engaged in this defense work. Ford broke ground for its new aircraft engine plant in September, 1940, but nearly a year elapsed before a force of 5,000 men was engaged in manufacturing the huge Pratt & Whitney Double Wasp engines.

Thus new orders placed now for tanks, such as are under negotiation with Ford and General Motors, will do little to relieve the unemployment situation in the coming six months except for draftsmen, designers and toolmakers. Eight or nine months must elapse before such facilities are ready to hire production workers. The only immediate relief is the increase in orders placed for military products for which the manufacturing facilities and the raw materials are already available. This might be exemplified by the machine guns which AC Spark Plug, Saginaw Steering Gear and Kelsey-Hayes Wheel Co. are turning out. Or shell manufacture



The figures used as a basis for the charts on this and the facing page were supplied to the Tolan Committee by Ford, General Motors, Chrysler, Hudson and Packard and cover Michigan plants only.

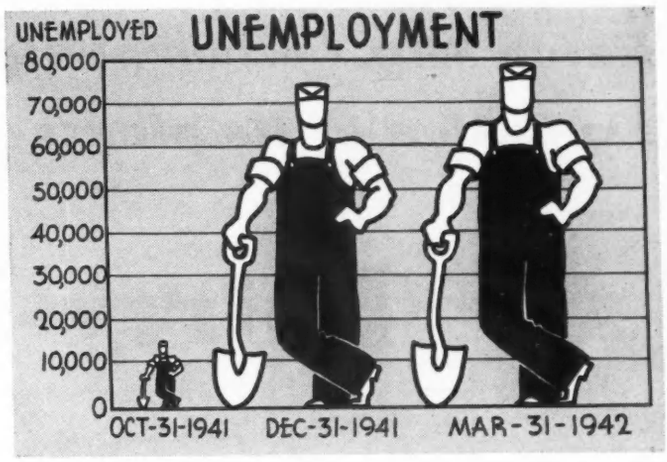
Although defense and British war orders placed in the U. S. now total in excess of 60 billion dollars, only a relatively small percentage of this has been placed under contract. And in many cases there is a long tooling up period necessary before the productive facilities can be placed in operation to employ labor. The Chrysler Tank Arsenal was begun in September, 1940, but it was not until August, 1941, that a working force of any size was in the plant turning out the finished 28-ton monsters. This is no criticism of the Chrysler Corp., which did a fine job in turning its engineering talents to building a vehicle which bears little resemblance to the motor car. It is merely an acknowl-



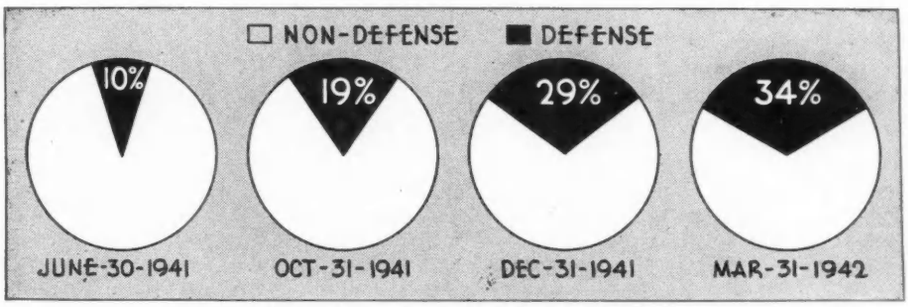
Increasing Number of Michigan Automobile Workers Engaged in Defense Production.

might be stepped up at Oldsmobile, Motor Wheel and Chevrolet Gear & Axle. Even Army trucks orders might be accelerated at Dodge, Ford or Chevrolet.

A corollary to this placement of additional defense orders with companies having the productive capacity is the more intensive use of this production equipment. This involves the addition of a third and fourth shift, provided the necessary raw materials are available. Very few defense plants in the automotive industry are working more than two shifts, although a number are working a 60-hour week. In certain plants, some departments work overtime and a third shift to relieve bottlenecks in the production schedule. But four-shift operations are virtually unknown in the industry at the present time.



Decreasing Number of Michigan Automobile Workers Engaged in Civilian Production.

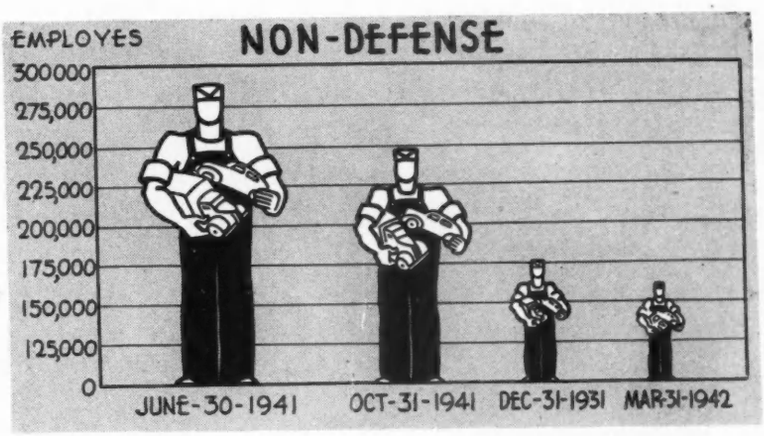


Increasing Percentage of Workers in Michigan Automobile Plants Engaged in Defense Production.

An obstacle to four-shift operations has been the unions' refusal to waive time and a half or double time for Saturday and Sunday work. The unions are perfectly agreeable to four 40-hour shifts per week in a plant, with the other eight hours for maintenance, but they want to protect their premiums for week-end work, fearing that once lost they will not be regained. Negotiations are now in prospect between the UAW-CIO and several defense plants for operations on a seven-day, four-shift basis. The union's proposal is to so arrange the shifts that each group of men works the same number of Saturdays and Sundays over a certain period of time. Rather than pay the week-end premiums, the unions propose to absorb this in the basic rate by raising that rate and maintaining an equalized wage for each shift. This is designed to prevent workers from seeking Saturday and Sunday work to swell their incomes. Union officials say that this scheme will raise unit costs but little and that workers will compensate by taking more responsibility, but industrialists are likely to be skeptical of such claims.

The transfer of workers from civilian to defense production has not proved difficult from the training standpoint. Companies have set up classes as well as on-the-job training to prepare automotive workers for defense jobs. The mechanical aptitude of the automotive workers has proven helpful. When the Chevrolet motor and assembly plants at Buffalo were shut down

(*Turn to page* 68, *please*)



Estimated Increase in Number of Michigan Automobile Workers Out of Jobs Because of Curtailment of Normal Civilian Production, Lag in Placement of New Defense Orders and Shut-Downs During Change-Over Period.

Eaton Mfg. Co. completing wide-spread expansion of its plants to total —

Thirty-four Acres of

By JOSEPH GESCHELIN

LIKE most of the larger industrial units of the automotive industry, the Eaton Mfg. Co. has turned the skill of its engineers and the energy of its vast production establishment to the needs of national defense. Although its specialized Wilcox-Rich divisions in Michigan already are filled to capacity on valves, valve seat inserts and valve lifters for gasoline and Diesel engines and for aviation engines, and although the Cleveland plant is devoting its energies to the manufacture of axles for commercial and military uses, Eaton is completing a wide-spread expansion program to facilitate the fabrication of additional items as well as to increase productivity on its current commitments.

Major part of this expansion program is centered in the new aircraft parts plant recently placed in commission in

(Battle Creek, Mich.) Brush Surface Analyzer is an important piece of equipment in the aircraft valve inspection department, used for checking surface finish specifications.

(Cleveland Aircraft Parts Plant) Looking down one of the machine shop bays. The big 20 in. Lodge & Shipley lathe is in the foreground, a line of Foster Fastermatics at the extreme right, one of the Landis profile grinders is at the left. Note the gravity roller conveyor connecting the machines down the gallery.

Production Floor Space

(Detroit Spring Plant) Volute springs for medium tanks being oil-quenched after closely controlled heat treatment. Equipped for both flat and coil spring manufacture, this plant has a considerable volume of defense work for tanks, military trucks, and anti-aircraft guns.

Cleveland, principally for the production of propeller shaft assemblies and other parts for Wright engines. To be noted later are the additions to Michigan plants, primarily to increase the productivity of aircraft engine valves. Moreover, a department has been established for the making of Pratt & Whitney engine countershaft flyweights.

Even among its associates in the vast automotive industry which Eaton has served well for 30 years there may not be a full realization of the scope of its manufacturing activities. Without going too far into details, the following will cover the principal items made by the various divisions—truck axles both conventional and two-speed, valves, valve seat inserts, valve lifters, hydraulic valve lifters, cylinder liners, coil springs, leaf springs, heavy volute springs for the new Army tanks, permanent mold castings, car heaters, stampings of various kinds, spring washers, bumper guards, snap rings, etc.

Augmented by the recent additions, the Eaton group boasts a grand total of some 34 acres of productive floor space. This may be summarized briefly by noting the areas and general character of output of the individual divisions in the following outline:

Axle plant and general offices in Cleveland, accounting for 372,500 sq. ft. of floor space. Today this plant is augmented by the addition of the new aircraft parts plant, contributing a productive floor space of 75,565 sq. ft.

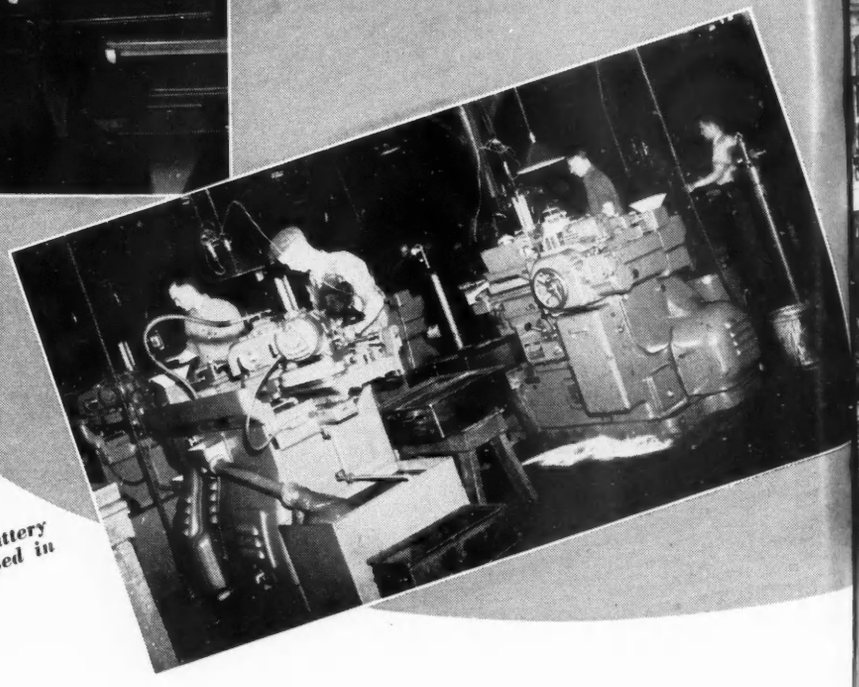
Foundry in Vassar, Mich., with a floor space of 103,700 sq. ft. makes sand castings but it is noted particularly as the exclusive source for permanent mold castings. Complexly cored castings as well as simple solid forms are made by this process on 12-head semi-automatic, air-operated machines with rotating molds and suction cooling, feature great accuracy, low porosity, uniformity of structure.

Heater plant in Cleveland with a floor space of 60,664 sq. ft.

Spring plant and Detroit offices are located in Detroit, boasting a floor space of 199,910 sq. ft. Eaton entered the leaf spring business in 1923 with the acquisition of the Perfection Spring Co., added coil spring equipment in 1930, thus enabling the company to participate in the growth of large coil spring production with the advent of the "knee action" suspensions. Today this plant also serves as a sub-contractor

This is the Sixty-fourth in the series of monthly production features

(Battle Creek, Mich.) South Bend lathe department, tooled for the formation of the cavity for sodium-cooling in the aircraft valve head.



(Saginaw, Mich.) Part of a battery of Heald internal grinders used in valve seat production.

in supplying volute springs for the new Army tanks, coil springs for anti-aircraft guns and leaf springs for scout cars and military trucks.

Spring washer plant in Massillon, Ohio, with a floor space of 147,828 sq. ft., produces the Reliance spring washers so widely used in all manner of mechanical equipment.

Stamping plant in Cleveland with a floor space of 79,600 sq. ft., is noted for chromium-plated hub caps, bumper guards, gasoline tank caps and radiator caps featuring the patented quarter-turn locking device.

Wilcox-Rich division in Battle Creek, Mich., with a floor space of 153,950 sq. ft., produces intake and exhaust valves, sodium-cooled aircraft valves.

Wilcox-Rich division in Saginaw, Mich., with a floor space of 101,650 sq. ft., specializes in the manufacture of valve lifters, valve seat inserts, and the famous line of Zero-Lash hydraulic valve lifters. A new plant, which will be devoted exclusively to aircraft engine parts, is under way and will more than double plant capacity.

Wilcox-Rich division in Marshall, Mich., with a floor space of 64,720 sq. ft., is primarily a mass-production plant for making valves and valve lifters for large-volume car builders.

All of these manifold activities are intimately coordinated with the central research laboratory in Detroit where a technical staff is engaged in fundamental research and in a general program of routine testing of the technical products produced in the various plants of the company. The laboratory is generously equipped with modern dynamometer equipment, instrumentation and accessory scientific apparatus specifically required in engine research.

Due to diversified character of manufacturing activity, it is manifestly difficult to cover the production activity of the establishment with any degree of thoroughness in a single survey. Because of this, the writer has personally visited a number of the major units and will base the sampling of coverage upon items of national defense, stressing more in detail the operation of the new aircraft parts plant. Nevertheless, our readers will have a visualization of the entire establishment through the medium of a carefully selected pictorial section touching practically every corner of the many units.

Cleveland Axle Plant

The axle plant is producing the familiar line of products for national defense and for other uses, features many items of new production equipment. Among these are several new heat treating furnaces supplied by Surface Combustion Corp.; a newly developed Ajax salt bath hardening furnace with Micromax control; several of the new Cleveland Rigidturner machines which are adapted from the familiar Cleveland hobbing machines.

In addition, there is a battery of two 12 in., 6-spindle, National Acme-Gridley chucking machines and two 10 in., 4-spindle Acme Gridleys. The 12-in., ma-

(Cleveland Axle Plant) Another unusual piece of heat treating equipment is this new Ajax salt bath furnace which is used for the heat treatment of a variety of gears and small parts. It is full-automatic in its cycle, the work being moved along on the large screw conveyor which may be seen in the center. Important feature of the furnace is the fact that one operator can handle it alone, loading at the left, unloading at the right.

(Cleveland Aircraft Parts Plant) Close-up of one of the many special Walker-Turner flexible drive tools for grinding, polishing, and burring operations.

(Reliance Spring Washer Plant, Massillon, Ohio) Eaton draws and rolls various types and sizes of wire for the consumption of the spring washer division as well as for customers requiring wire of special cross-section.

(Cleveland Aircraft Parts Plant) Flange holes in the propeller shaft are held to extremely fine tolerances as to spacing, hole size, and surface finish. The 24 holes are drilled and reamed on the multiple-spindle set-ups in the background in Barnes Hydram hydraulic drilling machines; then precision-bored with cemented-carbide tools, one hole at a time on the Ex-Cell-O single-end precision boring machine in the foreground.

Factory Routing on Valve Lifters

Operations and Equipment

Receiving **INSPECTION**
Bench

NORMALIZE
Furnace

Disc **FACE**
Besly pedestal grinder

Form **DRILL**, turn oil groove
New Britain automatic

DRILL ⅛ hole to chamfer
Drill press

BURR oil hole
Bench

BURR ⅛ hole on I.D.
Bench

Rough **GRIND** body
Cincinnati grinder

GRIND face
32-spindle grinder

Spherical **GRIND** face
32-spindle grinder

INSPECT face
Bench

Indicate face
Bench

ROCKWELL
Rockwell

REAM
Drill press

WASH and blow out
Tank

Bench **INSPECT**
Bench

GRIND O.D. of head
O.D. grinder

Semi-**GRIND** body
Cincinnati grinder

POLISH face and break corner
Foster polisher

Finish **GRIND** body
Cincinnati grinder

WASH in oil
Oil tank

INSPECT face before ferrox
Bench

WASH before ferrox
Tank

FERROX
Electric furnace

Wire **BRUSH**

WASH after ferrox
Tank

Visual **INSPECT**

Length and plug **GAGE**

Ring **GAGE**

Snap **GAGE** for undersize

WASH in oil

INSPECT I.D.

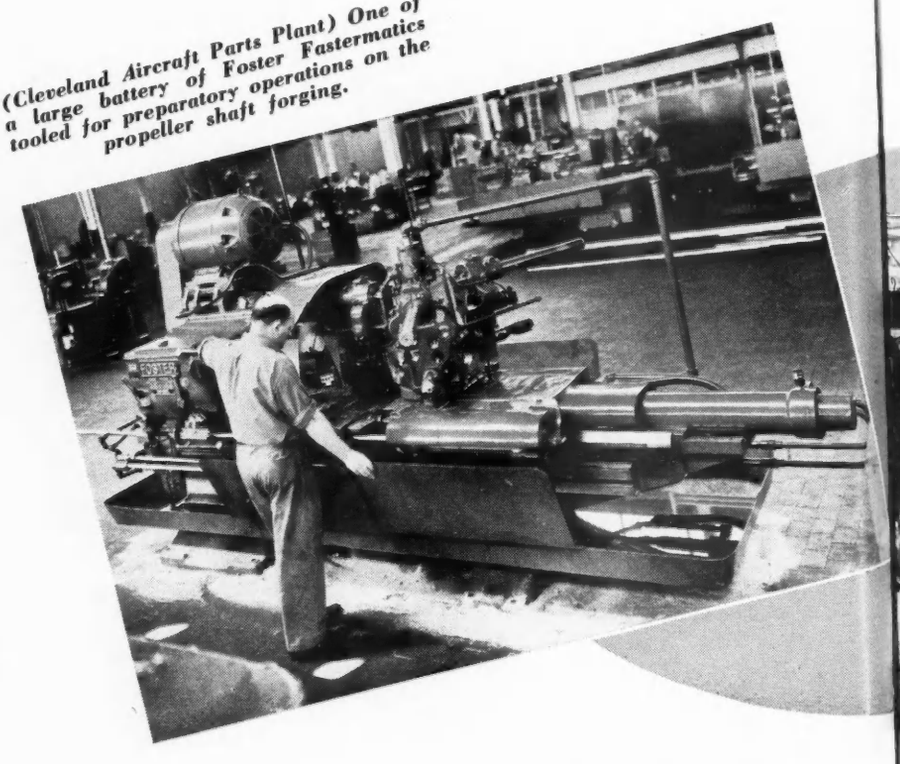
chines are the largest in use in this country, weigh upwards of 30 tons each.

Another noteworthy item of equipment is the big vertical American surface broaching machine employed for the broaching of the four half bores in each half of the differential case. They have had exceptional success with this set-up, as the broaching operation has consistently produced nicely matching bores of fine finish and within close tolerances, in one pass of the broach.

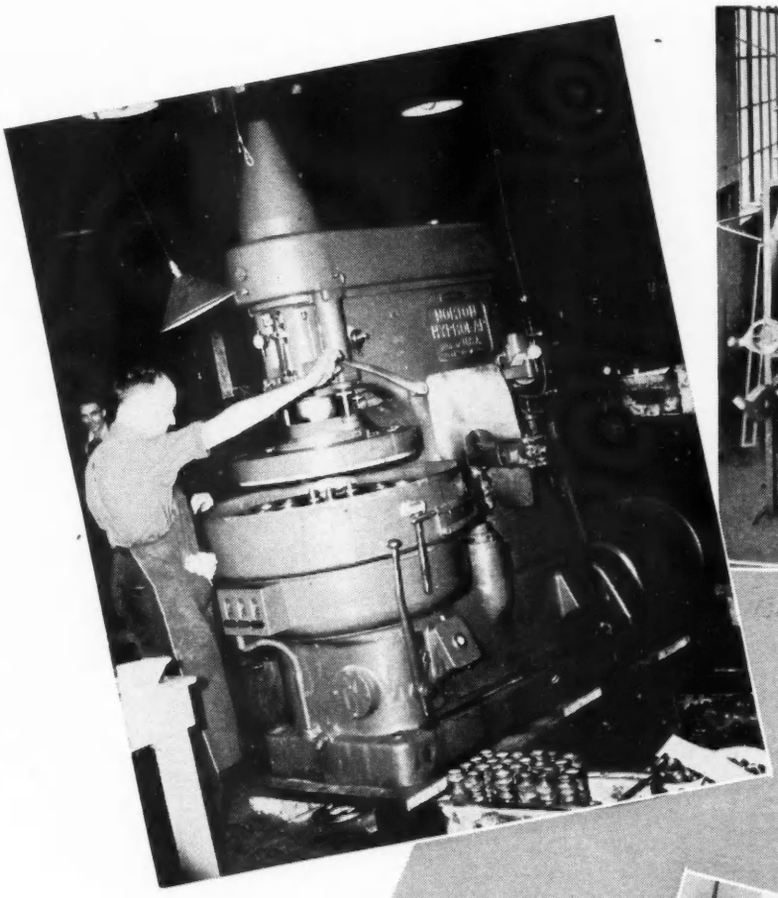
Like other producers, Eaton has faced the problem of substituting alternate materials for the alloy steels required for national defense products. The introduction of the new materials necessitated changes in heat treat equipment and procedure in order to develop the physicals formerly secured. Some of the parts demand an entirely new heat treatment and for this purpose they have installed a very compact heat treating set-up, comprising a new quench tank and drawing furnace, both of which are conveyorized. The last step in the process is a pass through the Niagara washing machine which is mounted directly above the draw tank.

One of the first installations of the Surface Combustion rotary hearth furnace with atmospheric control was made in this plant, is used for the hardening of a variety of parts such as—spiders, bevel gears, drive pinions, king pins, etc. Principal advantage of this type of furnace is derived from the fact that parts are loaded directly on the hearth and, consequently, require no moving conveyors. Moreover, the equipment usually can be handled by one operator —loading and unloading at the same station.

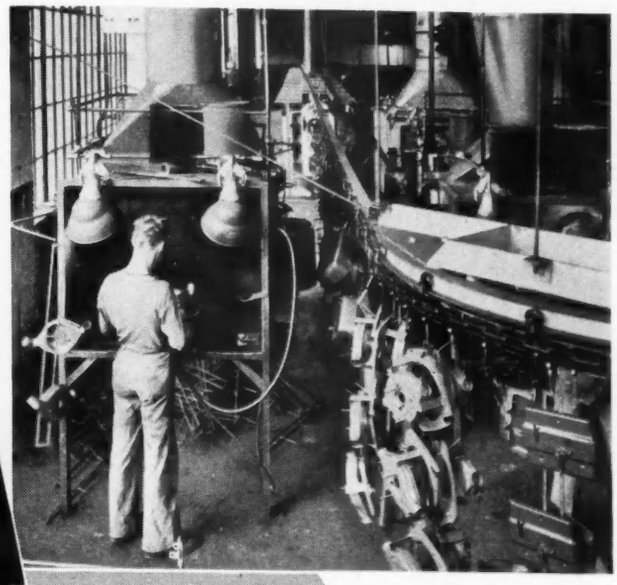
From the metallurgical standpoint, the major advantage is in its use of a special controlled atmosphere which produces hardened parts free of scale and of decarburization. This is accomplished by the use of the Char-Mo atmosphere, consisting essentially of 2/3 nitrogen, 1/3 carbon monoxide, with only minute traces of water vapor and carbon dioxide.



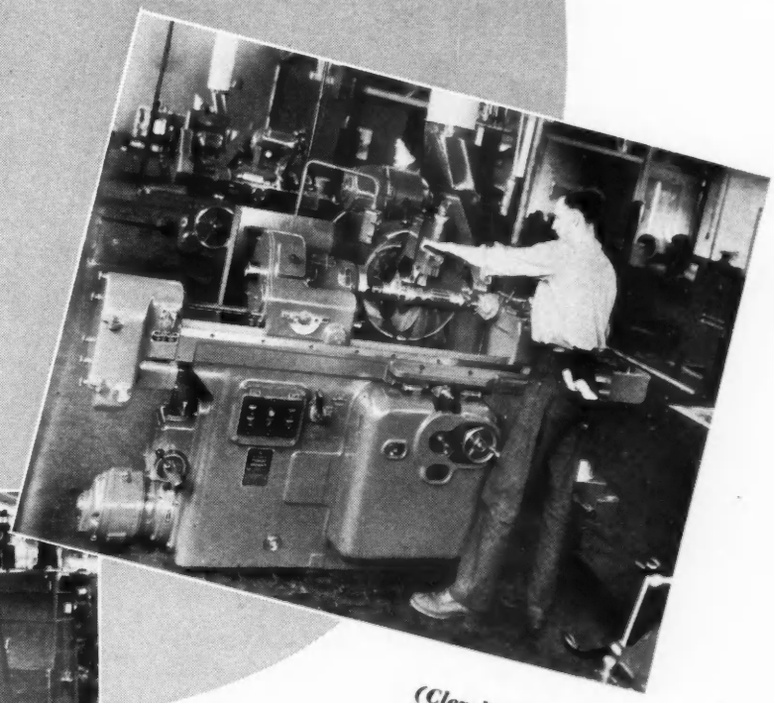
(Cleveland Aircraft Parts Plant) One of a large battery of Foster Fastermatics tooled for preparatory operations on the propeller shaft forging.



(Saginaw, Mich.) Close-up of a new Norton Hyprolap machine employed for the lapping of valve seat inserts and other parts.



(Eaton Heater Plant, Cleveland) This view shows car heater shells and sub-assemblies being spray-enameled, then hooked onto the monorail conveyor headed for the infra-red baking unit in the rear.



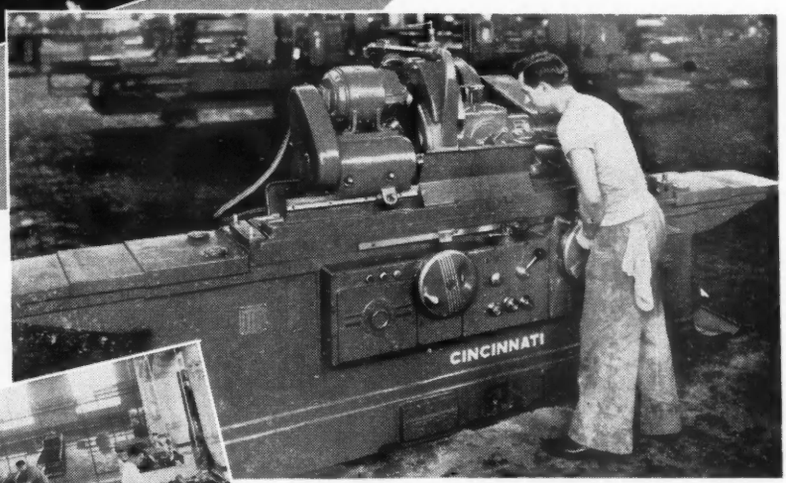
(Cleveland Aircraft Parts Plant) Latest edition of the Jones & Lamson precision thread grinder shown finishing the thread on a propeller shaft.

(Cleveland Axle Plant) Perhaps the largest machines of their type to be found anywhere in the country are these National Acme-Gridley 12 in., six-spindle chucking machines, weighing upwards of 30 tons each.

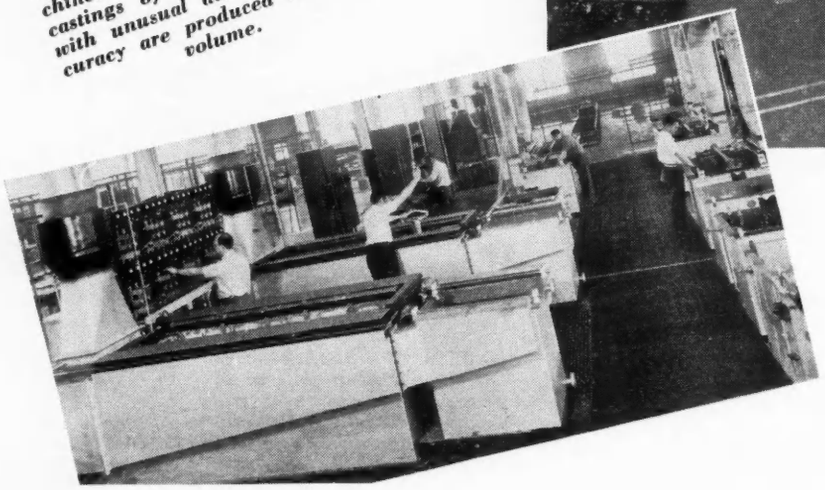
(Cleveland Axle Plant) Spindles and pinion yokes for front wheel drive military trucks are turned on these Cleveland Rigidturner machines.

(Saginaw, Mich.) Threads on all aircraft engine parts are precision ground on one of the Ex-Cell-O thread grinders.

(Eaton Foundry, Vassar, Mich.) One of a battery of the 12-head, rotating semi-automatic, air-operated, suction cooled permanent mold machines in action. Gray iron castings of low porosity and with unusual dimensional accuracy are produced in large volume.



(Cleveland Aircraft Parts Plant) Three final grinding operations on the propeller shaft sleeve are performed on 10 x 36 Cincinnati plain grinders.



(Left) (Cleveland Aircraft Parts Plant) View of the new plating department equipped by Hanson-Van Winkle-Munning Co., for electroplating copper, cadmium, and chromium.

(Battle Creek, Mich.) View of one of the two batteries of the new Landis hydraulic grinders tooled for finishing aircraft valves.

The furnace incorporates gas-fired radiant tubes—something quite unique in a rotary furnace design. It is heated with natural gas, consuming about 700 c.f.h. per hr. The capacity of the furnace at 1520 deg. Fahr. is 800 lb. of parts per hr.

Mechanical and temperature controls are most interesting. For mechanical control the drive is equipped with a time clock which can vary the speed of the cycle from 30 to 120 min., permitting an intermittent motion of about 12 in. Temperature is controlled automatically by means of two L & N Silver Anniversary Model S recording controllers of the potentiometer type.

Perhaps the most novel piece of heat treating equipment is the new Surface Combustion Corp. pot-type annealing furnace for drawing the flanges of axle shafts to facilitate free machining. The flanges are immersed to a measured depth in a lead pot, arranged to hold 14 shafts, seven on each side. For flexibility, the pot has sufficient burner capacity to be used for cyanide hardening at 1650 deg. Fahr.

Average time cycle for heating the flanges to 1350 deg. Fahr. is 10 to 15 min., depending on size. Heating of the pot is accomplished by two adjustable long or short flame burners mounted on opposite ends. This is said to permit rapid and uniform heating by radiation and convection. The pot is equipped with automatic temperature control.

The big National Acme-Gridley chucking machines are used for machining malleable iron differential cases, about 5½ in. in diameter, weighing 18 lb. apiece. The machine has 12-in. chucks (nominal outside diameter) maximum swing of 12 in., maximum length of turning 12 in. It takes a floor space of 6 ft. x 15 ft. Spindle speeds and tool feeds are mechanically controlled, stopping and starting, while chuck opening and closing are controlled hydraulically. Speeds, feeds and rigidity are designed for maximum efficiency and accuracy using the best of the modern tool materials including the cemented-carbides.

The sequence of operations on the differential cases, mentioned above, is shown in the table below.

Cleveland Aircraft Parts Plant

The new aircraft parts plant marks the entry of Eaton as a sub-contractor on propeller shaft assemblies and components for Wright engines.

New equipment consists of many items familiar to automotive production executives, features a large battery of Foster Fastermatics, Heald internal grinders, Landis grinders, Norton grinders, Sundstrand stub lathes, Cincinnati grinders, Ex-Cell-O precision boring machine, and other machines noted on the routings. In addition, there is a large number of the Walker-Turner flexible shaft tools for all manner of polishing and burring operations so essential in the finishing of finely machined aircraft parts.

Too, there is a battery of the new J & L thread grinding machines for finishing threads on the propeller shaft after hobbing on the Lees-Bradner thread miller. The threads are inspected on a J & L Comparator. Fitchburg grinders are employed for spline grinding. Typical of the special grinding machines is the Landis grinder, fitted with an indexing wheel head, used for producing the profile at the flange of the propeller shaft. The wheel profile controls the accuracy of the operation and is dressed automatically with special diamond dressing tools.

Factory Routing on Differential Cases

1st (loading) front
UNLOAD, LOAD

2nd (lower) front
Rough **BORE** spherical dia., rough **TURN** and **FACE** large diameter, rough face small diameter

3rd (lower) rear
Finish **TURN** O.D. **CHAMFER** large dia., Finish bore spherical dia., finish bore small dia. Chamfer & rough bore medium diameter

4th (center) rear
Finish **FACE** large diameter, semi-finish face, rough **REAM** and **CHAMFER** small dia., **UNDER CUT** & finish face medium diameter

5th (upper) rear
Finish **FACE** medium diameter

6th (upper) front
Finish **BORE** large diameter, finish ream small diameter

Factory Routing on Valve Seats

Operations and Equipment

FORGE and cut off
Cleveland hot header

ANNEAL forging
Anneal furnace

SANDBLAST

REMOVE high **FLASH**
Lathe

Rough **TURN** O.D., face on side, turn 0.095-0.105 radius
New Britain chucking machine

FACE opposite end and rough **FORM** radius
New Britain chucking machine

Rough **GRIND** O.D.
Cincinnati grinder

INSPECT
Bench

ANNEAL
Anneal furnace

Face one side
Blanchard grinder

Lap
Norton Hydrolap

Semi-**GRIND** O.D.
Cincinnati grinder

Rough **FORM** 0.095-0.105 radius
lathe

Finish **TURN** I.D. & radius
lathe

POLISH 0.003-0.015 radius, polish radius, remove stamp burr
Bench

Finish **GRIND** O.D.
Cincinnati grinder

FINISH 0.095-0.105 radius
lathe

BURR all over
lathe

Final **INSPECT**
Bench

ETCH letter "D" in I.D.
Electric pencil

Among the familiar procedures is the Magnaflux test on the propeller shaft and sleeve as the final operation before assembly.

Protection of finely finished surfaces is afforded by the use of spirit cleaning spray booths which are found in many places along the machine lines. The propeller shaft routing indicates seven washing operations while the sleeve has one. The assembly routing shows five separate washings. In the spirit spray cleaning process, the part is thoroughly washed and then coated with a protective oil film which prevents rusting of fine surfaces due to exposure to the atmosphere.

To take care of numerous plating operations—electroplating with chromium and cadmium—Eaton has installed in a compact and self-contained plating department equipped by Hanson-Van Winkle-Munning.

Touching on a few high-spots of the propeller shaft routing, note the use of the American Wheelabrator for sand-blasting the forging after heat treatment in preparation for machining. It also is of interest to observe the great care with which the flange holes are produced, taking three operations for this purpose. The holes are drilled, then reamed, then bored individually on a No. 2112-A Ex-Cell-O single-end Junior precision boring machine.

Details of the final assembly of the shaft, as outlined on the routing, are most interesting. In the first place, all of the component parts as they are produced are inspected by Eaton men, Wright inspectors, and Army inspectors, routed to the stock room. Only the officially inspected parts are drawn out for assembly. As noted, the sleeve is a shrink-fit assembly in the shaft. This is done by immersing the shaft in a heated oil tank, held at 400 deg. Fahr., while the sleeve is chilled to minus 32 deg. Fahr. in a refrigerated cabinet.

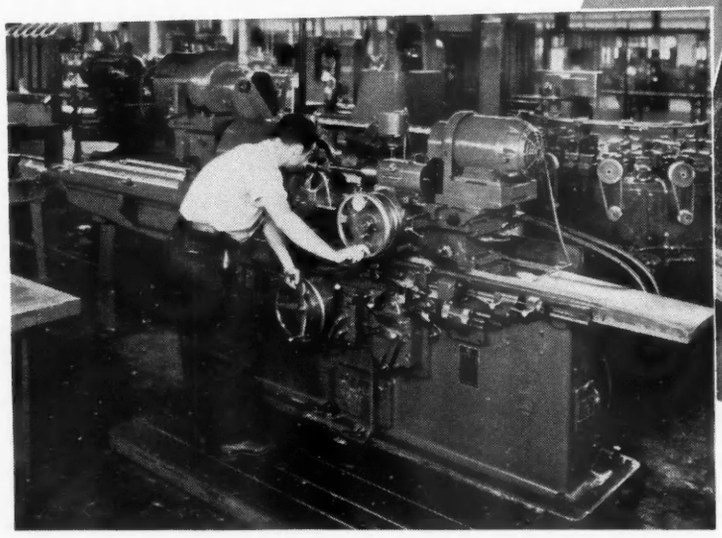
The bushings are assembled later, using the same procedure—namely, heating the shaft, chilling the bushings. After the bushings have been installed, they are precision-bored to assure accuracy of bore and axial alignment. The precision-boring is done in two operations—first with a cemented-carbide tool, then with a diamond for the final finish.

In addition to the spirit spray cleaning treatment of metal surfaces, all of the oil passages of the assembly are sealed with beeswax to prevent the entry of dirt or formation of rust. The wax is removed only when the unit is ready for assembly with the engine.

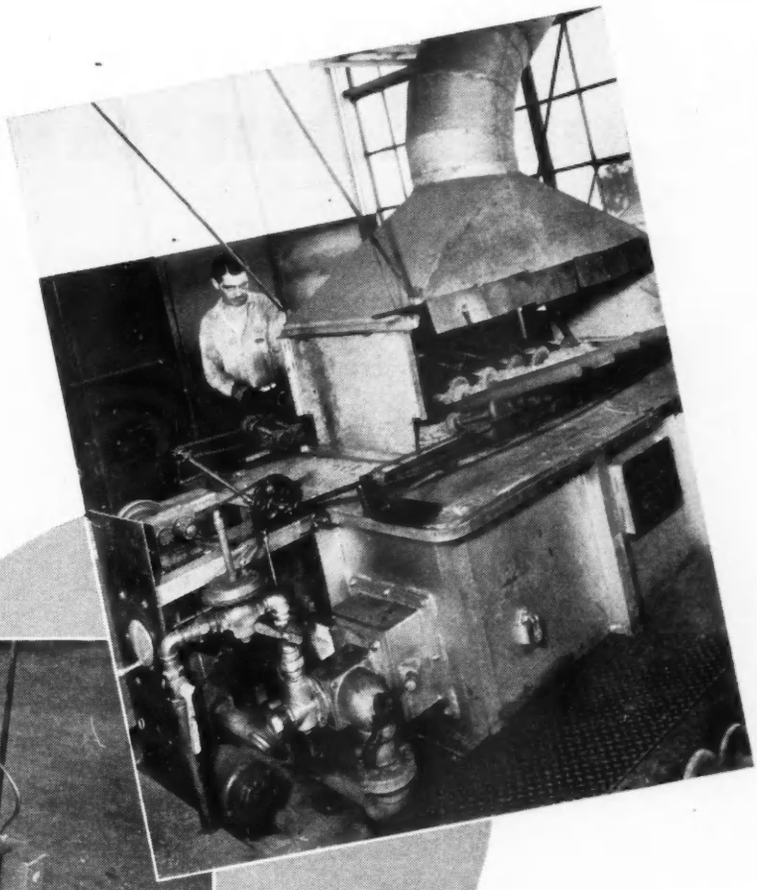
Apart from the evident features of modernity in this new building, we were impressed with the use of the Bulldog Bustributor system which carries the power lines for the various machines. This type of power distribution system provides unusual flexibility since machines can be moved at any time to any new location without the usual changes in wiring.

(*Turn to page 72, please*)

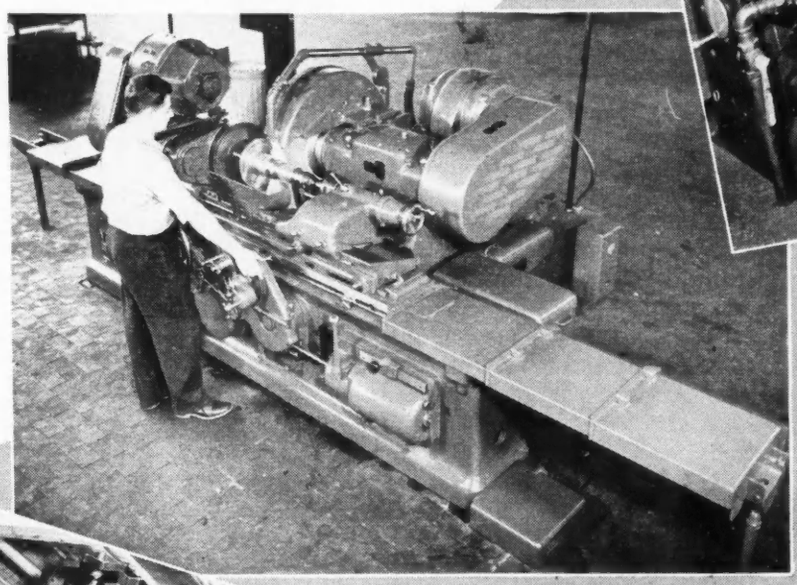
(Cleveland Aircraft Parts Plant) Here is one of the Heald No. 72A-5 internal grinders, grinding the inside bore of the sleeve.

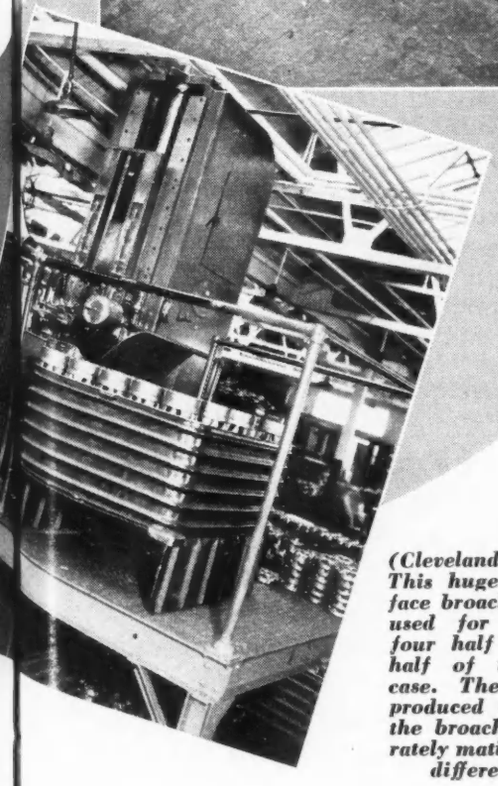


(Cleveland Axle Plant) Unusual piece of heat treating equipment is this Surface Combustion Co., pot-type furnace for drawing the flanges of axle shafts. The machine takes ten shafts at a time, five on each side, draws the flange in the lead pot held at 1350 deg. F. Average time cycle ranges from 10 to 15 minutes depending upon the size and mass of the work.



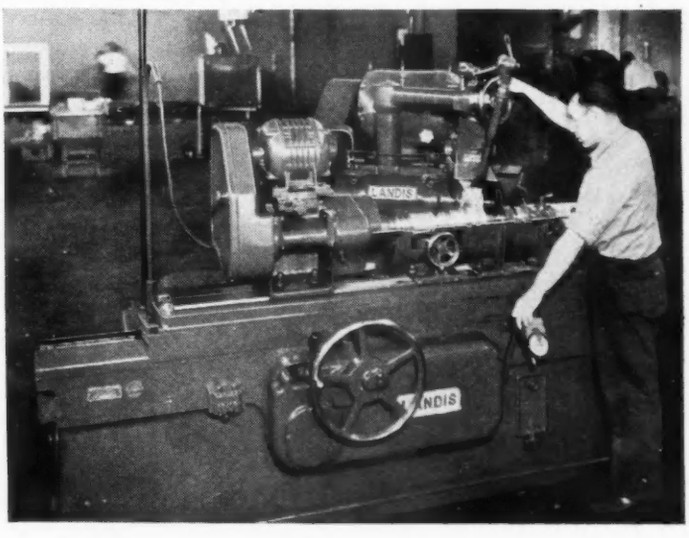
(Cleveland Aircraft Parts Plant) Close-up of one of a battery of the 14 x 36 in. Norton cylindrical grinders on the propeller shaft.



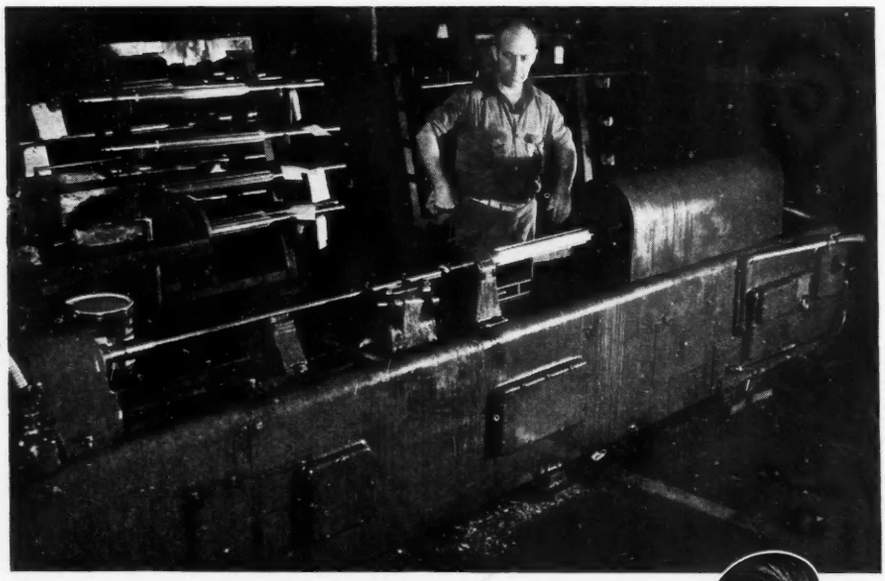


(Cleveland Axle Plant) This huge American surface broaching machine is used for broaching the four half bores in each half of the differential case. The half-bores are produced in one pass of the broach, provide accurately mating bores for the differential spider.

(Cleveland Aircraft Parts Plant) An intimate view of the Landis profile grinder used for forming the flange radius on the propeller shaft.



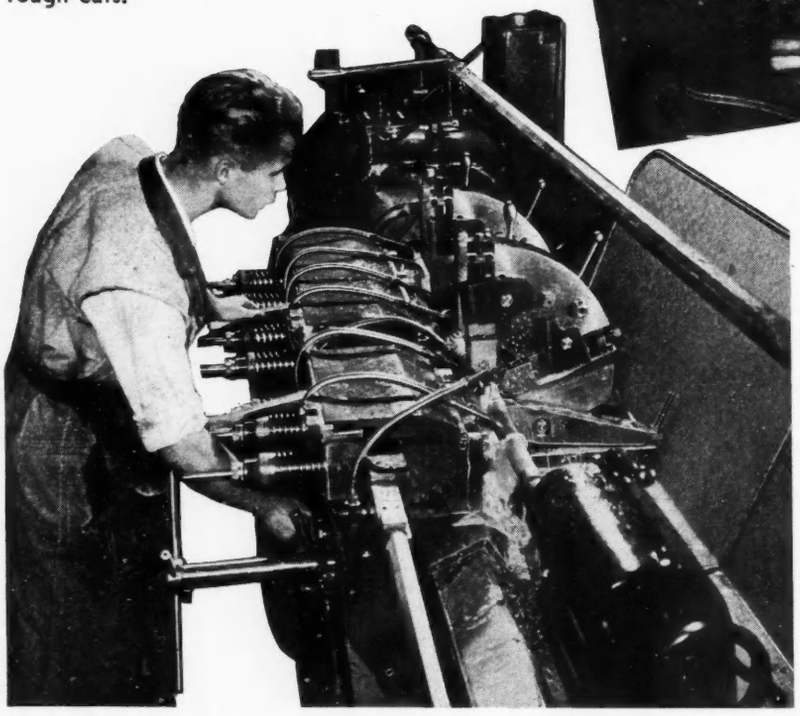
Oerlikon Anti-Aircraft



(Left) Boring an Oerlikon 20-mm. gun barrel on a Barnes Drill at the Pontiac Motor Division gun plant.

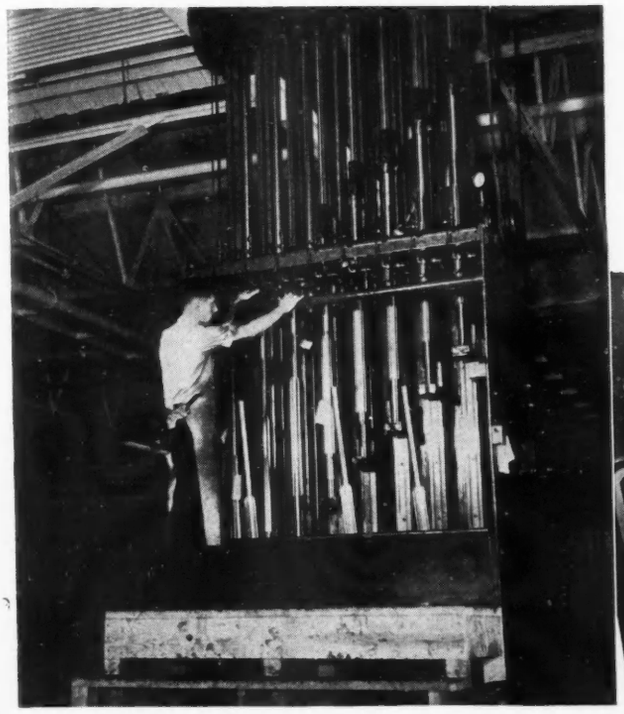
(Below) Final delicate hand grinding operations on the Oerlikon gun barrel at the Pontiac Motor Division gun plant. Note the safety glasses that both men wear. Also, the irregular shape of the bench top for the ease and convenience of the men.

(Below) Lo-Swing lathe in the Pontiac Motor Division defense plant controlled by master cam. One of the first machining operations on the gun barrel after the first rough cuts.



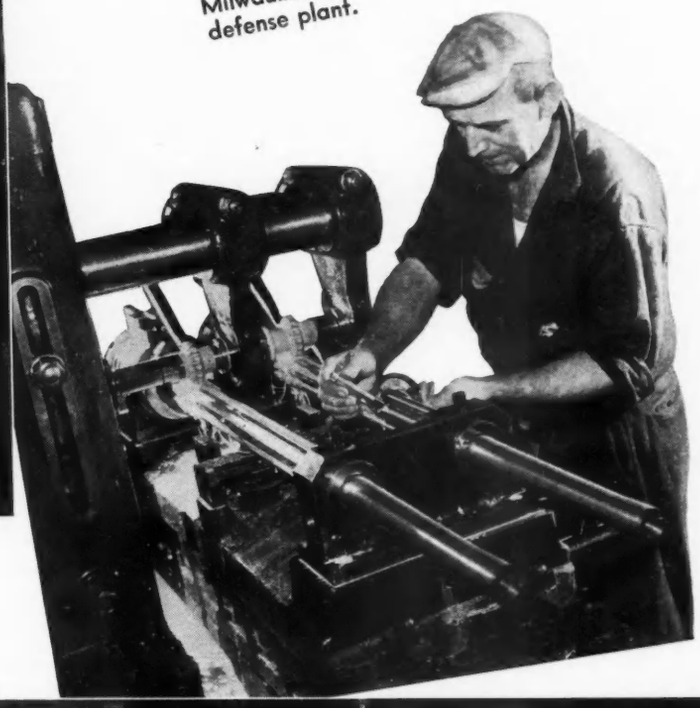
Now that production on the Oerlikon anti-aircraft gun is in full swing at the Pontiac Motor Div., General Motors Corp., some examples of initial manufacturing activity have been released for publication. The illustrations on these pages

Guns Made at Pontiac



(Above) Eight barrel vertical reamer in the Pontiac Motor Division defense plant on which both ends of Oerlikon gun barrels are reamed after boring operations.

(Below) Milling the air-cooled slots of the Oerlikon gun barrel on a Kearney & Trecker Milwaukee mill in the Pontiac Motor Division defense plant.

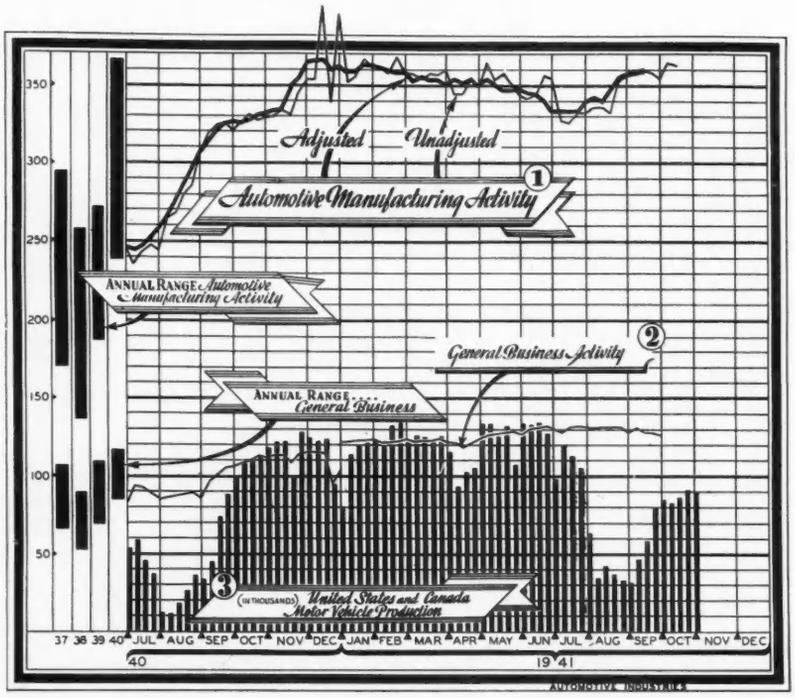


(Lower right) Pontiac Motor Division defense plant. Grinding Oerlikon gun barrel to size just back of the air cooling slots on a Landis external grinder.

have been so selected as to show the application of advanced methods. The complete story will be told in AUTOMOTIVE INDUSTRIES when the new plant, now under construction, has been placed in operation.

[*Our own view of automotive production and sales; authoritative interpretation of general conditions*]

October Production in High Gear



Weekly Indexes of Automotive General Business

DESPITE curtailment, production in October is estimated at 395,000 passenger cars and trucks. This will make it the third largest total for the month in the industry's history, exceeded only by 1940 and 1928, and even a shade bigger than October, 1929, when 394,540 vehicles were produced. However, it marks a 23 per cent decline from October, 1940, when the record for the month of 514,374 units was established.

Reason for the relatively high production rate for October is due to the fact that passenger car output for the first four months of the 1942 model year, beginning with August, was cut only 26.5 per cent from the comparable months of last year. But the cuts will become increasingly more drastic in order to accomplish the full cut of 50 per cent for the entire model year. Thus the December cut is 48.4 per cent from 1940 levels and the January reduction will amount to 51.1 per cent. Quotas have not been established beyond January by OPM but a prospective allotment of production through the full 1942 model year sets next June's output at 133,917 passenger cars, which would mark a drop of 68 per cent from the 418,983 units produced in June, 1941. January's quota of 204,898 passenger cars is below January output for each of the previous seven years except 1938, when the total was 155,505 units.

Although quotas have been set on future passenger car and light truck production, they serve merely as a ceiling beyond which output cannot go and there is no guarantee that production will reach that level. This is due to the increasing demands of the ever expanding national defense program upon raw materials like steel, copper, nickel and rubber which are needed by the automobile industry. In announcing January passenger car curtailment, Leon Henderson said, "We are not fixing production quotas for January. We are merely establishing a maximum limit to which the manufacturers can produce — if they are successful in obtaining sufficient material."

Henderson's statement was underlined shortly afterwards when the OPM issued its order forbidding the use of copper for automobile trim and body hardware, horns, hub and gas tank caps and heaters. Use of copper in electric wiring and generators is exempt from the ban but usage for radiators is reduced to 70 per cent of the stocks consumed in a 1940 base period. Although such a limitation probably would be sufficient to supply present needs for curtailed passenger car output, trucks and replacement purposes, there is no positive assurance that this much copper will be available. Indications now point to a shortage of 750,000 tons in 1942, according to OPM, so it is possible that automobile companies may find their supplies still further curtailed. At present there is no adequate substitute for copper or brass in radiators.

Companies already are experimenting with painted grilles and plastic and painted trim as a result of the OPM order forbidding use of brightwork containing nickel, aluminum or chrome after Dec. 15. This order would have the effect of creating two series of 1942 models—those with bright work and those without. Chrome for bumpers may be an exception.

Retail sales in the U. S. for September totaled 172,674 units, according to the AMA, the smallest for any month since September, 1939, and a decline of 12 per cent from September, 1940. It also marked the first time that retail sales fell below the same month of the previous year since October, 1938.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. of New York to Jan. 1, 1941, and *New York Times* weekly business index after that date; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

Passenger Car Specifications

Price, Weight and Body Data

Following are delivered prices at factory, as of October 1, 1941, for cars with standard equipment and include all federal taxes with the exception of Chrysler, Crosley, DeSoto, Dodge, Ford, Lincoln, Mercury and Plymouth. Optional equipment, state or local taxes, transportation and finance charges are extra.

BODY, MAKE AND MODEL	Delivered Price	Shipping Weight
BUICK		
Special 40A		
Util. Coupe	1076	3510
Conv. Coupe	1361	
Sedan, 4d.	1171	3650
Bus. Sedanet, 2d.	1097	3555
Fam. Sedanet, 2d.	1134	3610
Special 40B		
Sedan, 4d.	1213	3760
Bus. Sedanet, 2d.	1108	3650
Fam. Sedanet, 2d.	1166	3705
Est. Wagon	1561	
Super-Equip. 40B		
Sedan, 4d.	1297	3785
Fam. Sedanet	1224	3725
Super 50		
Sedan, 4d.	1391	3890
Conv. Coupe	1570	
Sedanet, 2d.	1339	3800
Century 60		
Sedan, 4d.	1465	4065
Sedanet, 2d.	1413	3985
Roadmaster 70		
Sedan, 4d.	1601	4150
Conv. Coupe	1822	
Sedanet, 2d.	1528	
Limited 90		
Tour. Sedan, 8p.	2828	4710
Limousine	2734	4765
Sedan, 4d., 6p.	2418	4665
For. Sedan	2576	4695
CADILLAC		
Series 61		
Club Coupe, 5p.	1560	4035
Sedan, 4d.	1647	4115
Series 62		
Club Coupe, 5p.	1667	
Club Coupe, 5p.	1754	
Sedan, 4d.	1754	
Sedan, 4d.	1836	
Conv. Coupe, 5p.	2020	
Series 63		
Sedan, 4d.	1882	4115
Series 60 Spec.		
Sedan, 4d.	2435	
Sedan, div., 4d.	2589	
Series 67		
Sedan, 5p.	2896	
Sedan, div., 5p.	3045	
Sedan, 7p.	3045	
Imperial, 7p.	3204	
Series 75		
Sedan, 5p.	3306	4750
Sedan, div., 5p.	3459	4810
Sedan, 7p.	3459	4800
Imperial, 7p.	3613	4860
For. Sedan, 5p.	4330	4900
For. Sedan, 7p.	4484	4915
Bus. Sedan, 9p.	3152	4750
Bus. Imperial, 9p.	3306	4810
CHEVROLET		
Stylemaster BG		
Bus. Coupe	Consult Local Dealer	3055
Coupe, 5p.		3060
Town Sedan, 2d.		3085
Sport Sedan, 4d.		3125
Fleetmaster BH		
Bus. Coupe		3080
Coupe, 5p.		3085
Town Sedan, 2d.		3130
Sport Sedan, 4d.		3160
Cabriolet		3385
Station Wagon		3425
CHEVROLET (Continued)		
Fleetline BH		
Aerosedan, 2d.	Consult Local Dealer	3105
Sportmaster		3165
CHRYSLER		
Royal 6		
Coupe	1075	3350
Club Coupe	1168	3430
Brougham, 2d.	1154	3455
Sedan, 4d.	1177	3500
Town Sedan	1222	3505
Sedan, 8p.	1535	
Limousine	1605	
Windsor 6		
Coupe	1140	3375
Club Coupe	1228	3450
Conv. Coupe	1420	3685
Brougham, 2d.	1220	3465
Sedan, 4d.	1255	3520
Town Sedan	1295	3530
Sedan, 8p.	1605	
T. & C. Wagon, 6p.	1595	3640
T. & C. Wagon, 9p.	1685	3725
Limousine	1685	
Saratoga 8		
Coupe	1325	
Club Coupe	1380	3820
Brougham, 2d.	1355	
Sedan, 4d.	1405	3900
Town Sedan	1450	
New Yorker 8		
Coupe	1385	3780
Club Coupe	1450	3815
Conv. Coupe	1640	4065
Brougham, 2d.	1440	
Sedan, 4d.	1475	3905
Town Sedan	1520	3925
Crown Imper.		
Sedan		
Sedan, 8p.		
Limousine		
CROSLEY		
Conv. Coupe	950	
Conv. Cabriolet	975	
Pkw. Delivery	1035	
Pickup Delivery	1100	
Liberty Sedan	1050	
Panel Delivery	1085	
Station Wagon	1105	
DE SOTO		
De Luxe		
Bus. Coupe	1010	3190
Coupe, 6p.	1092	3270
Sedan, 2d.	1075	3270
Sedan, 4d.	1103	3315
Town Sedan	1147	3335
Sedan, 7p.	1455	
Custom		
Coupe	1048	3205
Club Coupe	1142	3270
Conv. Coupe	1317	3510
Brougham	1142	3305
Sedan, 4d.	1152	3330
Town Sedan	1196	3385
Sedan, 7p.	1504	
Limousine	1580	
DODGE		
De Luxe		
Coupe	895	3080
Club Coupe	995	3155
Sedan, 2d.	958	3155
Sedan, 4d.	998	3195
Custom		
Club Coupe	1045	3195
Conv. Coupe	1245	3485
Brougham, 2d.	1008	3195
Sedan, 4d.	1048	3230
DODGE (Continued)		
Custom		
Town Sedan	1105	3280
Sedan, 7p.	1395	
Limousine	1475	
FORD		
Special Six		
Coupe, 3p.	780	
Tudor Sedan	815	
Fordor Sedan	850	3033
De Luxe Six		
Coupe, 3p.	805	2958
Tudor Sedan	840	3122
Sedan Coupe	865	3045
Fordor Sedan	875	3141
Super DeL. Six		
Coupe, 3p.	850	3030
Tudor Sedan	885	3136
Sedan Coupe	910	3109
Fordor Sedan	920	3179
Conv. Coupe	1080	
Station Wagon	1115	3453
Special V8		
Coupe, 3p.	790	
Tudor Sedan	825	
Fordor Sedan	860	
De Luxe V8		
Coupe, 3p.	815	2978
Tudor Sedan	850	3141
Sedan Coupe	875	3065
Fordor Sedan	885	3161
Sup. De Luxe V8		
Coupe, 3p.	860	3050
Tudor Sedan	895	3159
Sedan Coupe	920	3120
Fordor Sedan	930	3200
Conv. Coupe	1090	
Station Wagon	1125	3468
HUDSON		
Six		
Club Sedan, 2d.		2895
Sedan, 4d.		2940
Coupe, 3p.		2795
Club Coupe		2945
Util. Coach		2905
Util. Coupe		2900
De Lux Six		
Club Sedan, 2d.		2935
Sedan, 4d.		2975
Coupe, 3p.		2845
Club Coupe		2900
Conv. Sedan		3140
Super Six		
Club Sedan, 2d.		3035
Sedan, 4d.		3080
Coupe, 3p.		2950
Club Coupe		3010
Conv. Sedan		3200
Station Wagon		3315
Commodore Six		
Club Sedan, 2d.		3090
Sedan, 4d.		3145
Coupe, 3p.		2995
Club Coupe		3190
Conv. Sedan		3280
Commodore 8		
Club Sedan, 2d.		
Sedan, 4d.		3280
Coupe, 3p.		3130
Club Coupe		3205
Conv. Sedan		3400
Com. Custom 8		
Club Coupe		3235
Sedan, 4d.		3395
LINCOLN-ZEPHYR		
Standard		
Sedan	1700	3980
Club Coupe	1700	3810
Coupe, 3p.	1650	3790
Conv. Coupe	2150	
Custom		
Sedan	1795	3980
Club Coupe	1795	3810
Coupe, 3 p.	1735	3790
Continental		
Cabriolet	3000	
Coupe	3000	4060
Custom		
Sedan	2950	4380
Limousine	3075	
MERCURY		
Coupe, 3p.	995	3073
Sedan, 2d.	1030	3228
Sedan Coupe	1055	
Town Sedan	1065	3263
Club Conv.	1215	3288
Station Wagon	1260	3528
NASH		
Ambassador 600		
Sedan, trk., 4d.	993	2655
Bus. Coupe	918	2540
Brougham, 2d.	958	2580
Sedan, fb., 4d.	968	2650
Sedan, Slps., 2d.	948	2605
Ambassador 6		
Sedan, trk., 4d.	1159	3335
Bus. Coupe	1084	3200
Brougham, 2d.	1124	3230
Sedan, fb., 4d.	1134	3335
Sedan, Slps., 2d.	1114	3285
Ambassador 8		
Sedan, trk., 4d.	1209	3485
Bus. Coupe	1134	
Brougham	1174	3385
Sedan, fb., 4d.	1184	
Sedan, Slps., 2d.	1134	3485
OLDSMOBILE		
Special Six-66		
Bus. Coupe	992	3230
Club Coupe	1035	3265
Club Sedan	1050	3270
Sedan, 2d.	1040	3280
Sedan, 4d.	1088	3315
Town Sedan	1088	3320
Conv. Coupe	1277	
Station Wagon	1376	
Dynamic Six		
Club Sedan	1095	3395
Club Sedan	1105	3460
Sedan, 4d.	1153	3465
Sedan, 4d.	1242	3510
Special Eight		
Bus. Coupe	1035	3365
Club Coupe	1077	3405
Club Sedan	1033	3405
Sedan, 2d.	1093	3410
Sedan, 4d.	1130	3455
Town Sedan	1130	3435
Conv. Coupe	1319	
Station Wagon	1418	
Dynamic Eight		
Club Sedan	1138	3520
Club Sedan	1225	3570
Sedan, 4d.	1196	3580
Sedan, 4d.	1284	3640
Custom Eight		
Club Sedan	1319	
Sedan, 4d.	1378	
Conv. Coupe	1561	
PACKARD		
Clipper Spec. 6-2000		
Bus. Coupe	1216	3365
Club Sedan	1251	3415
Tour. Sedan	1286	3435
Clipper Cust. 6-2010		
Club Sedan	1306	3440
Tour. Sedan	1341	3460
Model 2020		
Conv. Coupe	1421	3315
Clipper Spec. 8-2001		
Bus. Coupe	1271	3490
Club Sedan	1308	3540
Tour. Sedan	1341	3560
Clipper Cust. 8-2011		
Club Sedan	1361	3565
Tour. Sedan	1396	3585
Model 2021		
Conv. Coupe	1531	3585
Super Eight-160 Clipper-2003		
Club Sedan	1678	3985
Tour. Sedan	1739	4005
Model 2023		
Conv. Coupe	1842	3905
Model 2004		
Tour. Sedan	1954	4090
Model 2005		
Tour. Limousine	2231	4445
Tour. Sedan	2103	4325
Model 2055		
Bus. Limousine	2077	4435
Bus. Sedan	1949	4315
Cus. Sup. 8-180 Clipper 2006		
Club Sedan	2169	4010
Tour. Sedan	2271	4030
Special 2006		
Conv. Victoria	4708	3920
Model 2007		
For. Sedan	3126	4390
Tour. Sedan	2527	4280
Cabriolet	4995	4075
Model 2008		
Tour. Limousine	2742	4540
Tour. Sedan	2614	4525
LeB. Limousine	5937	4850
LeB. Sedan	5681	4740
Town Car	5097	4200
PLYMOUTH		
De Luxe		
Coupe	812	2930
Club Coupe	885	2990
Sedan, 2d.	851	2985
Sedan, 4d.	889	3025
Util. Sedan, 2d.	842	
Spec. De Luxe		
Coupe	855	2955
Club Coupe	928	3035
Conv. Coupe	1078	3255
Sedan, 2d.	895	3020
Sedan, 4d.	935	3060
Town Sedan	980	3085
Station Wagon	1145	
PONTIAC		
Torpedo Six		
Bus. Coupe	967	3210
Sport Coupe	1019	3260
Sedan Coupe	1025	3255
PONTIAC (Continued)		
Torpedo Six		
Sedan, 2d.	1015	3265
Sedan, 4d., 6w.	1062	3305
Sedan, 4d., 4w.	1062	3295
Conv. Sed. Cpe.	1251	
Streamliner Six		
Sedan Coupe	1060	3355
Sedan, 6w., 4d.	1118	3415
Station Wagon	1360	
Sed. Cpe., Chief	1112	3400
Sedan, 4d., Chief	1170	3460
Station Wagon	1412	
Torpedo Eight		
Bus. Coupe	993	
Sport Coupe	1035	3320
Sedan Coupe	1051	3320
Sedan, 2d.	1041	3325
Sedan, 4d., 6w.	1088	3360
Sedan, 4d., 4w.	1088	3355
Conv. Sed. Cpe.	1277	
Streamliner Eight		
Sedan Coupe	1086	3430
Sedan, 4d., 6w.	1144	3485
Station Wagon	1386	
Sed. Cpe., Chief	1138	3490
Sedan, 4d., Chief	1196	3515
Station Wagon	1438	
STUDEBAKER		
Champion Custom		
Coupe, 3p.	810	2415
Coupe, 5p.	835	2455
Club Sedan	840	2495
Cruis. Sedan	870	2520
De Luxe		
Coupe, 3p.	845	2435
Coupe, 5p.	870	2470
Club Sedan	875	2520
Cruis. Sedan	905	2545
Commander Six		
Custom		
Sedan Coupe	1108	3195
Cruis. Sedan	1128	3265
Land Cruiser	1163	3290
De Luxe		
Sedan Coupe	1153	3210
Cruis. Sedan	1173	3280
Land Cruiser	1208	3305
Skyway		
Sedan Coupe	1188	3240
Cruis. Sedan	1208	3309
Land Cruiser	1243	3315
President 8		
Custom		
Sedan Coupe	1242	3440
Cruis. Sedan	1262	3485
Land Cruiser	1297	3510
De Luxe		
Sedan Coupe	1297	3445
Cruis. Sedan	1307	3500
Land Cruiser	1342	3515
Skyway		
Sedan Coupe	1322	3470
Cruis. Sedan	1342	3540
Land Cruiser	1377	3540
WILLYS		
Coupe, 2p.	758	2180
Sedan, 4d.	811	2251
Coupe, DeL.	835	2200
Sedan, 4d., DeL.	882	2295
Coupe, Plains.	887	2250
Sedan, Plains.	915	2345
Station Wagon	1056	2510

General and Engine Specifications

Line Number	PASSENGER CAR MAKE AND MODEL	Wheelbase (In.)	Tread (In.) Front	Tread (In.) Rear	Overall Length with Bumpers (In.)	Shipping Weight (Lb.) Cheapest 5 Pass., 4 door Sedan or equivalent	Tire Size (In.)	Gear Ratio 5 Pass., 4 door Sedan	ENGINE: No. of Cylinders, Bore and Stroke (In.)	Valve Arrangement	Cylinder Arrangement	Cylinder Head Material	Piston Displacement (Cu. In.)	Taxable Horsepower	Maximum Brake Hp. at Specified R.P.M.	Maximum Torque (Lb. Ft.) at Specified R.P.M.	Compression Ratio (to 1) Standard	Compression Ratio (to 1) Optional	Compression Pressure (Lb.) Pressure	Compression Pressure (Lb.) At What R.P.M.	Weight per Cu. In. 5 Pass., 4 door Sedan *	Weight per Hp. 5 Pass., 4 door Sedan *	Hp. per Cu. In.	Crankshaft Revolutions per Mile †	Performance Factor ††	Line Number
1	Buick-Special.....42-40A	118	59 1/8	62 3/16	201 13/16	3650	6.50/15	4.10	8-3 3/32x4 1/8	I	IL	CI	248.0	30.6	110–3400	200–2000	6.00	6.30	112	CS	16.73	37.73	.44	2985	34.5	1
2	Buick-Ex. Spec.....42-40B	121	58 7/8	61 11/16	207 1/2	3760	6.50/16	4.40	8-3 3/32x4 1/8	I	IL	CI	248.0	30.6	110–3400	200–2000	6.00	6.30	112	CS	17.18	38.73	.44	3203	36.1	2
3	Buick-Super.....42-50	124	58 7/8	61 11/16	212 3/8	3890	6.50/16	4.40	8-3 3/32x4 1/8	I	IL	CI	248.0	30.6	118–3600	206–2000	6.30	.....	115	CS	17.70	37.20	.48	3203	35.0	3
4	Buick-Century.....42-60	126	59 1/8	62 5/16	212 1/4	4065	7.00/15	3.90	8-3 7/16x4 3/8	I	IL	CI	320.2	37.8	165–3800	278–2200	6.70	.....	115	CS	14.26	27.67	.51	2843	38.6	4
5	Buick-Roadmaster.....42-70	129	59 1/8	62 5/16	217 1/8	4150	7.00/15	4.10	8-3 7/16x4 1/8	I	IL	CI	320.2	37.8	165–3800	278–2200	6.70	.....	115	CS	14.52	28.18	.51	2989	39.8	5
6	Buick-Limited.....42-90	139	58 13/16	63 1/16	226 1/4	4665	7.50/16	4.55	8-3 7/16x4 1/8	I	IL	CI	320.2	37.8	165–3800	278–2200	6.70	.....	115	CS	16.13	31.30	.51	3094	36.3	6
7	Cadillac.....61, 62, 63, 60S	(a)	59	63	(c)	4115	7.00/15	3.77	8-3 1/2x4 1/2	L	V	CI	343.0	39.2	150–3400	283–1700	7.25	6.25	182	1000	13.34	30.77	.43	2748	39.9	7
8	Cadillac.....67, 75	(b)	58 1/2	62 1/2	(d)	4750	7.50/16	4.27	8-3 1/2x4 1/2	L	V	CI	346.0	39.2	150–3400	283–1700	7.25	6.25	182	1000	15.17	35.00	.43	2904	37.0	8
9	Chevrolet.....	116	57 5/8	60	195 7/8	3125	6.00/16	4.11	6-3 1/2x3 3/4	I	IL	CI	216.5	29.4	90–3300	174–1200	6.50	No	.....	.....	16.74	40.28	.42	3066	35.4	9
10	Chrysler-Roy. & Win.....C-34	121 1/2	57	60 3/32	207 3/4	3500	6.25/16	3.90	6-3 7/16x4 1/2	L	IL	CI	250.6	28.3	120–3300	200–1600	6.60	.....	125	CS	15.96	33.33	.48	2878	34.9	10
11	Chrysler-Sar. & N.Y.....C-36	127 1/2	57 13/16	61 9/16	213 3/8	3900	7.00/15	3.91	8-3 1/4x4 7/8	L	IL	CI	323.5	33.8	140–3600	260–1800	6.80	.....	125	CS	13.60	31.43	.43	2850	40.6	11
12	Chrysler-Crown Imp.....C-37	145 1/2	57 13/16	61 7/8	231 3/8	.....	7.50/15	3.58	8-3 1/4x4 7/8	L	IL	CI	323.5	33.8	140–3600	260–1800	6.80	.....	125	CS	.....	.....	.43	2570	.....	12
13	Crosley.....'42	80	40	40	120	975	4.25/12	5.14	2-3x2 1/2	L	IL	CI	35.3	7.2	12-3800	20-2800	5.60	No	80	240	41.78	122.92	.34	5191	.....	13
14	De Soto-DeL. & Cust.....S-10	121 1/2	57	60 3/32	207 1/2	3315	6.25/16	3.90	6-3 7/16x4 1/4	L	IL	CI	236.6	28.3	115-3800	190-1600	6.60	.....	125	CS	16.12	33.17	.49	2878	34.5	14
15	Dodge-DeL. & Cust.....D-22	119 1/2	57	60 3/32	201 1/2	3195	6.00/16	4.10	6-3 1/4x4 5/8	L	IL	CI	230.2	25.3	105-3600	185-1600	6.70	.....	125	CS	16.05	35.19	.46	3059	36.8	15
16	Ford-Six.....	114	58	60	.....	3033	6.00/16	3.78	6-3.30x4.40	L	IL	CI	226.0	26.1	90-3300	180-1200	6.70	.....	165	2000	15.63	39.25	.40	2820	34.8	16
17	Ford-Eight.....	114	58	60	.....	3053	6.00/16	3.78	8-3.06x3.75	L	V	CI	221.0	30.0	90-3800	156-2200	6.20	.....	100	CS	16.08	39.48	.41	2820	33.9	17
18	Hudson-Six & DeL.....20	116	56 7/8	59 1/2	(e)	2940	(f)	4.55	6-3x4 1/8	L	IL	CI	175.0	21.6	92-4000	138-1400	7.25	.....	125	CS	19.66	37.39	.53	3508	34.4	18
19	Hudson-Super. & Com. 6...21, 22	121	56 7/8	59 1/2	207 3/8	3080	(g)	4.11	6-3x5	L	IL	CI	212.0	21.6	102-4000	168-1200	6.50	.....	120	CS	16.89	35.10	.48	3066	35.1	19
20	Hudson-Com. 8.....24, 25	121	56 7/8	59 1/2	207 3/8	3280	(h)	4.11	8-3x4 1/2	L	IL	CI	254.0	28.8	128-4200	198-1600	6.50	.....	119	CS	14.88	29.53	.50	3033	39.4	20
21	Hudson-Com. Cust. 8.....27	128	56 7/8	59 1/2	214 3/8	3395	6.50/15	4.11	8-3x4 1/2	L	IL	CI	254.0	28.8	128-4200	198-1600	6.50	.....	119	CS	15.33	30.43	.50	2992	37.8	21
22	Lincoln-Zeph. & Cont.....	125	59	60	217	3980	7.00/15	4.22	12-2.93x3.75	L	V	CI	306.0	41.4	130-3800	.....	7.00	No	.....	.....	14.63	34.46	.42	3076	40.7	22
23	Lincoln-Custom.....	138	59	60	230	4380	7.00/15	4.22	12-2.93x3.75	L	V	CI	305.0	41.4	130-3800	.....	7.00	No	.....	.....	15.95	37.54	.42	3076	37.3	23
24	Mercury.....	118	58	60	204.6	3263	6.50/15	3.53	8-3.18x3.75	L	V	CI	239.0	32.5	100-3800	176-2100	6.40	No	100	CS	15.74	37.63	.42	2577	31.7	24
25	Nash-Ambassador 600.....42-40	112	56	59 3/4	196 1/2	2655	5.50/16	4.11	6-3 1/4x3 3/4	L	IL	CI	172.6	23.4	75-3600	138-1200	6.87	.....	120	350	18.28	42.07	.43	3169	33.4	25
26	Nash-Ambassador 6.....42-60	121	57 1/2	60 1/2	205 1/2	3335	6.25/16	4.11	6-3 3/8x4 3/8	I	IL	CI	234.8	27.3	105-3400	203-1600	6.50	.....	125	350	16.33	36.52	.45	3033	35.9	26
27	Nash-Ambassador 8.....42-80	121	57	61 1/4	205 1/2	3465	6.50/16	4.11	8-3 1/8x4 1/4	I	IL	CI	260.8	31.2	115-3400	200-1600	6.60	.....	110	350	15.28	34.65	.44	2992	37.9	27
28	Oldsmobile-Special Six.....66	119	58	61 1/2	204	3315	6.00/16	4.11	6-3 1/2x4 1/8	L	IL	CI	238.1	29.4	100-3400	190-1400	6.50	.....	115	CS	16.02	38.15	.42	3066	37.0	28
29	Oldsmobile-Dynamic Six.....76	125	58	61 1/2	212	3465	6.50/15	4.30	6-3 1/2x4 1/8	L	IL	CI	238.1	29.4	100-3400	190-1400	6.50	.....	115	CS	16.65	39.65	.42	3130	36.4	29
30	Oldsmobile-Special 8.....68	119	58	61 1/2	204	3455	6.50/15	3.90	8-3 1/4x3 7/8	L	IL	CI	257.1	33.8	110-3600	200-2000	6.50	No	107	CS	15.33	35.95	.43	2839	35.7	30
31	Oldsmobile-Dynamic 8.....78	125	58	61 1/2	212	3580	6.50/16	4.30	8-3 1/4x3 7/8	L	IL	CI	257.1	33.8	110-3600	200-2000	6.50	No	107	CS	15.87	37.09	.43	3130	38.1	31
32	Oldsmobile-Custom 8.....98	127	58	61 1/2	216	.....	7.00/15	4.30	8-3 1/4x3 7/8	L	IL	CI	257.1	33.8	110-3600	200-2000	6.50	No	107	CS	.....	.....	.43	3135	.....	32
33	Packard-Six.....2000-2020	120–122	59 1/4	60 5/16	(m)	3435	6.50/15	4.30	6-3 1/2x4 1/4	L	IL	CI	245.0	29.4	105-3600	192-2000	6.71	.....	.....	.....	16.06	37.48	.43	3130	37.7	33
34	Packard-Eight.....2001-2021	120–127	59 1/4	(i)	(n)	3560	(r)	(t)	8-3 1/4x4 1/4	L	IL	CI	282.0	33.8	125-3600	230-2000	6.85	.....	.....	.....	14.40	32.48	.44	2985	40.1	34
35	Packard-Sup. 8.....2003-23-4-5	127–38–48	59 5/8	(k)	(o)	4005	(s)	(u)	8-3 1/2x4 5/8	L	IL	CI	356.0	39.2	165-3600	292-2000	6.85	.....	.....	.....	12.65	27.30	.46	2858	43.7	35
36	Packard-Cus. Sup. 8....2006-7-8	127–38–48	59 5/8	(h)	(p)	4030	(s)	(u)	8-3 1/2x4 5/8	L	IL	CI	356.0	39.2	165-3600	292-2000	6.85	.....	.....	.....	12.72	27.45	.46	2858	43.5	36
37	Plymouth-DeL. & Spec. DL..P-14	117	57	59 13/16	195 1/8	3025	6.00/16	3.90	6-3 1/4x4 3/8	L	IL	CI	217.8	25.3	95-3400	172-1600	6.80	.....	125	CS	16.18	37.10	.44	2909	34.7	37
38	Pontiac-DeLuxe 6.....42-25	119	58	61 1/2	204 1/2	3295	6.00/16	4.10	6-3 5/16x4	L	IL	CI	239.2	30.4	90-3200	175-1400	6.50	7.50	160	1000	15.86	42.17	.38	3059	37.2	38
39	Pontiac-Stream. 6.....42-26	122	58	61 1/2	210 1/4	3415	6.50/16	4.30	6-3 5/16x4	L	IL	CI	239.2	30.4	90-3200	175-1400	6.50	7.50	160	1000	16.37	43.50	.38	3130	37.0	39
40	Pontiac-DeLuxe 8.....42-27	119	58	61 1/2	204 1/2	3355	6.00/16	4.10	8-3 1/4x3 3/4	L	IL	CI	243.9	33.8	103-3500	190-2200	6.50	7.50	158	1000	15.49	37.43	.41	3059	38.2	40
41	Pontiac-Stream. 8.....42-28	122	58	61 1/2	210 1/4	3485	6.50/16	4.30	8-3 1/4x3 3/4	L	IL	CI	248.9	33.8	103-3500	190-2200	6.50	7.50	158	1000	16.01	38.69	.41	3130	37.9	41
42	Studebaker-Champion 6.....4G	.....	56 1/4	57	193	2520	5.50/16	4.10	6-3x4	L	IL	CI	169.6	21.6	80-4000	134-2000	6.50	7.00	105	CS	17.82	37.75	.47	3161	34.3	42
43	Studebaker-Commander 6...12A	.....	58 1/4	60 5/16	210 1/4	3265	6.25/16	4.09	6-3 5/16x4 3/8	L	IL	CI	226.2	28.3	94-3600	176-1600	6.50	7.00	105	CS	16.64	41.79	.42	3018	35.0	43
44	Studebaker-President 8.....8C	.....	58 1/8	60 5/16	215 3/4	3485	7.00/15	4.09	8-3 7/16x4 1/4	L	IL	CI	250.4	30.0	117-4000	200-2400	6.50	7.00	105	CS	15.91	34.06	.47	2982	35.1	44
45	Willys-Americar.....442	104	55 1/4	58 1/4	181	2261	5.50/16	4.44	4-3 1/8x4 3/8	L	IL	CI	134.2	15.6	63-3900	108.1800	6.48	6.81	111	185	20.57	43.83	.47	3423	32.1	45

ABBREVIATIONS:

†—Computed on basis of tire revolutions per mile multiplied by rear axle ratio of cheapest 5-passenger, 4-door sedan

††—Computed on basis of displacement, rear axle ratio, effective tire diameter and shipping weight plus 500 pounds of lowest priced 5-passenger 4-door sedan

*—Performance data based on shipping weights plus 500 pounds

(a)—Models 61, 63—126 in.; 62—129 in.; 60S—133 in.

(b)—Model 67—139 in.; 75—136 in.

(c)—Models 61, 63—214 5/8 in.; 62—219 5/8 in.; 60S—223 3/8 in.

(d)—Model 67—228 1/4 in.; 75—226 1/2 in.

(e)—Model Six—198 1/4 in.; DeLuxe Six—200 1/2 in.

(f)—Model Six—5.50/16; DeLuxe Six—6.00/16

(g)—Model Super-Six—6.00/16; Comm. Six—6.25/16

(h)—Model 24—6.25/16; Model 25—6.50/15

(i)—Model 2021—60 5/8 in.; Model 2001—60 1/2 in.

(k)—Models 2004-7—59 1/2 in.; Models 2003-6-23—60 1/4 in.; Models 2005-8—62 7/8 in.

(m)—Model 2000—208 1/2 in.; Model 2020—201 in.

(n)—Model 2001—208 1/2 in.; Model 2021—206 1/2 in.

(o)—Model 2003—215 1/2 in.; 2023—205 1/4 in.; 2004—217 3/8 in.; 2005—227 1/4 in.

(p)—Model 2006—215 1/2 in.; 2007—217 3/8 in.; 2008—227 1/4 in.

(r)—Model 2001—6.50/15; 2021—7.00/15

(s)—Models 2003-6-23—7.00/15; 2004-5-7-8—7.00/16

(t)—4.10 on Model 2001; 4.09 on 2021

(u)—3.92 on Models 2003-6-23; 4.09 on 2004-7; 4.36 on 2005-8

CI—Cast Iron CS—Cranking Speed I—In Head

IL—In Line L—L-Head Motor No—No or None

V—Vee Type

Pistons, Rings, Connecting Rods

Line Number	PASSENGER CAR MAKE AND MODEL	No. of Cylinders, Bore and Stroke	PISTONS								PISTON RINGS								WRIST PIN				CONNECTING RODS			Line Number
								Clearance—Average (In.)		Ring Groove Depth (In.)		Oil				Compression										
			Make	Material	Features	Weight (Oz.) Without Rings, Pin or Bushing	Length (In.)	Top Land	Top of Skirt	Oil	Compression	Number Used	Width (In.)	Average Gap (In.)	Maximum Wall Thickness (In.)	Number Used	Width (In.)	Average Gap (In.)	Maximum Wall Thickness (In.)	Length (In.)	Diameter (In.)	Locked In—	Average Clearance (In.)	Length (In.)—Center to Center	Material (S.A.E. No.)	Weight (Oz.)	
1	Buick-Special 42-40A	8-3 3/16x4 1/8	Own	CI	CT, Lf	23.73	4 1/4	.0190	.0017	.167	.167	2	3/16	.015	.140	2	3/16	.015	(a)	2 11/16	.8126	R	.00035	7 5/8	X-1345	28.46	1
2	Buick-Ex. Spec. 42-40B	8-3 3/16x4 1/8	Own	CI	CT, Lf	23.73	4 1/4	.0190	.0017	.167	.167	2	3/16	.015	.140	2	3/16	.015	(a)	2 11/16	.8126	R	.00035	7 5/8	X-1345	28.46	2
3	Buick-Super 42-50	8-3 3/16x4 1/8	Own	CI	CT, Lf	23.73	4 1/4	.0190	.0017	.167	.167	2	3/16	.015	.140	2	3/16	.015	(a)	2 11/16	.8126	R	.00035	7 5/8	X-1345	28.46	3
4	Buick-Century 42-60	8-3 1/16x4 1/8	A-B	Al	CT, Trs, An	18.85	4 1/16	.0300	.0026	.182	.182	2	3/16	.015	.150	2	3/16	.015	(b)	3 1/16	.8746	R	.00035	8 1/4	1045	35.58	4
5	Buick-Roadmaster 42-70	8-3 1/16x4 1/8	A-B	Al	CT, Trs, An	18.85	4 1/16	.0300	.0026	.182	.182	2	3/16	.015	.150	2	3/16	.015	(b)	3 1/16	.8746	R	.00035	8 1/4	1045	35.58	5
6	Buick-Limited 42-90	8-3 1/16x4 1/8	A-B	Al	CT, Trs, An	18.85	4 1/16	.0300	.0026	.182	.182	2	3/16	.015	.150	2	3/16	.015	(b)	3 1/16	.8746	R	.00035	8 1/4	1045	35.58	6
7	Cadillac 61, 62, 63, 60S	8-3 1/16x4 1/2	A-B	Al	Ts, An	18.32	4 1/8	.0196	(c)	.160	(d)	2	3/16	.012	.150	2	(e)	.012	(f)	3 1/16	7/8	F	.00008	8 3/4	1035	37.68	7
8	Cadillac 67, 75	8-3 1/16x4 1/2	A-B	Al	Ts, An	18.32	4 1/8	.0196	(c)	.160	(d)	2	3/16	.012	.150	2	(e)	.012	(f)	3 1/16	7/8	F	.00008	8 3/4	1035	37.68	8
9	Chevrolet	6-3 1/16x3 3/4	Own	CI	Fh, O, Sp	26.90	3 3/4	.0165	SeF	.178	.158	1	.1862	.010	.155	2	.1237	.010	.155	3.150	.8647	R	SF	6 1/8	DFS	30.70	9
10	Chrysler-Roy. & Win. C-34	6-3 1/16x4 1/2	.....	CI	C, Rb	.....	3 1/2	.0080	.0013	.182	.181	2	3/16	.011	.150	2	1/8	.011	.169	2 7/8	3/4	F	.00040	7 1/8	MFS	.....	10
11	Chrysler-Sar. & N.Y. C-36	8-3 1/4x4 1/8	.....	Al	Us, C	16.30	3 7/8	.0152	(g)	.172	.169	2	3/16	.011	.145	2	3/16	.011	.162	2 3/4	3/4	F	.00010	9	MFS	.....	11
12	Chrysler-Crown Imp. C-37	8-3 1/4x4 1/8	.....	Al	Us, C	16.30	3 7/8	.0152	(g)	.172	.169	2	3/16	.011	.145	2	3/16	.011	.162	2 3/4	3/4	F	.00010	9	MFS	.....	12
13	Crosley	2-3x2 1/2	.....	CI	.....	17.50	2.802	.0135	.0043	.158	.138	1	1/4	.015	.135	2	1/8	.015	.130	2.636	.7497	F	.00020	4 3/4	1045	18.0	13
14	De Soto-DeL. & Cust. S-10	6-3 1/16x4 1/4	.....	CI	C, Rb	.....	3 1/2	.0080	.0013	.182	.181	2	3/16	.011	.150	2	3/16	.011	.169	2 7/8	3/4	F	.00040	8	MFS	.....	14
15	Dodge-DeL. & Cust. D-22	6-3 1/4x4 5/8	.....	Al	Us, C, Tp, Au	.....	3 11/16	.0175	.0006	.174	.171	2	3/16	.011	.145	2	3/16	.011	.162	2 3/4	5/8	F	.00010	7 11/16	MFS	.....	15
16	Ford-Six	6-3.30x4.40	Own	CS	.....	16.23	.....	.....	.....	.....	.....	1	.1885	.....	.....	2	.095	.....	.....	2.910	.850	F	.....	7	MFS	25.65	16
17	Ford-Eight	8-3.06x3.75	Own	CS	.....	11.82	.....	.....	.....	.....	.....	1	.1537	.014	.110	2	.0917	.014	.....	2.850	.7502	F	.0005	7	MFS	16.79	17
18	Hudson-Six & DeL. 20	6-3x4 1/8	Own	.....	C	16.00	2 3/4	.0200	.0012	.146	.146	2	.1560	.010	.123	2	.093	.010	.123	2 1/16	3/4	F	SF	8 5/8	DFS	31.36	18
19	Hudson-Super. & Com. 6 21, 22	6-3x5	Own	.....	C	16.00	2 3/4	.0200	.0012	.146	.146	2	.1560	.010	.128	2	.093	.010	.123	2 1/16	3/4	F	SF	8 1/16	DFS	31.96	19
20	Hudson-Com. 8 24, 25	8-3x4 1/2	Own	.....	C	16.00	2 3/4	.0200	.0012	.146	.146	2	.1560	.010	.128	2	.093	.010	.123	2 1/16	3/4	F	SF	8 1/16	DFS	31.36	20
21	Hudson-Com. Cust. 8 27	8-3x4 1/2	Own	.....	C	16.00	2 3/4	.0200	.0012	.146	.146	2	.1560	.010	.128	2	.093	.010	.123	2 1/16	3/4	F	SF	8 1/16	DFS	31.36	21
22	Lincoln-Zeph. & Cont.	12-2.93x3.75	Own	CS	.....	.....	.....	.0020	.....	.....	.....	1	.1847	.010	.107	2	.0932	.010	(h)	2.607	.7502	F	.0005	7.40	DFS	22.51	22
23	Lincoln-Custom	12-2.93x3.75	Own	CS	.....	.....	.....	.0020	.....	.....	.....	1	.1847	.010	.107	2	.0932	.010	(h)	2.607	.7502	F	.0005	7.40	DFS	22.51	23
24	Mercury	8-3.18x3.75	Own	CS	.....	12.70	.....	.0030	.....	.....	.....	1	.1537	.014	.112	2	.0917	.014	(i)	2.975	.7502	F	.0005	7	DFS	17.22	24
25	Nash-Ambassador 600 42-40	6-3 1/16x3 3/4	.....	Al	.....	.....	3 3/4	.0175	.....	.....	.....	1	.1860	.015	.....	2	.093	.015	.....	2.609	.8120	F	.....	6 3/4	Steel	24.00	25
26	Nash-Ambassador 6 42-60	6-3 1/16x4 3/8	.....	Al	.....	.....	3 7/8	.....	.0015	.175	.155	2	.1550	.018	.145	2	.124	.020	.145	2.804	.8745	F	SF	8 3/4	Steel	36.25	26
27	Nash-Ambassador 8 42-80	8-3 1/16x4 1/4	.....	Al	Ss, O, Tp, Au	16.00	3 11/16	.....	.0015	.175	.155	2	(k)	.015	.130	2	.124	.020	.140	2.574	.8747	F	SF	8 3/4	Steel	34.00	27
28	Oldsmobile-Special Six 66	6-3 1/16x4 1/16	Own	AS	Tp	27.00	3 3/4	.0265	.0012	.171	.187	2	3/16	.011	.155	2	3/16	.013	.172	3 5/16	55/64	P	.00045	7 13/16	X-1335	28.40	28
29	Oldsmobile-Dynamic Six 76	6-3 1/16x4 1/16	Own	AS	Tp	27.00	3 3/4	.0265	.0012	.171	.187	2	3/16	.011	.155	2	3/16	.013	.172	3 5/16	55/64	P	.00045	7 13/16	X-1335	28.40	29
30	Oldsmobile-Special 8 68	8-3 1/16x3 7/8	Own	AS	Tp	24.00	3 7/8	.0255	.0012	.171	.171	2	3/16	.011	.150	2	3/16	.011	.155	2 11/16	55/64	P	.00045	7 13/16	X-1335	28.30	30
31	Oldsmobile-Dynamic 8 78	8-3 1/16x3 7/8	Own	AS	Tp	24.00	3 7/8	.0255	.0012	.171	.171	2	3/16	.011	.150	2	3/16	.011	.155	2 11/16	55/64	P	.00045	7 13/16	X-1335	28.30	31
32	Oldsmobile-Custom 8 98	8-3 1/16x3 7/8	Own	AS	Tp	24.00	3 7/8	.0255	.0012	.171	.171	2	3/16	.011	.150	2	3/16	.011	.155	2 11/16	55/64	P	.00045	7 13/16	X-1335	28.30	32
33	Packard-Six 2000-2020	6-3 1/16x4 1/4	.....	CI	C	25.12	3 11/16	.....	.0024	.188	(l)	1	.1865	.011	.110	2	(o)	.012	(p)	3 7/16	7/8	F	PF	7 11/16	DFS	31.60	33
34	Packard-Eight 2001-2021	8-3 1/16x4 1/4	.....	CI	C	22.75	3 11/16	.....	.0024	.182	(m)	1	.1865	.011	.100	2	(o)	.012	(r)	2 11/16	7/8	F	PF	7 11/16	DFS	31.60	34
35	Packard-Sup. 8 2003-23-4-5	8-3 1/16x4 5/8	Al	Als	Au, C, Tp	20.25	3 7/8	.....	.0007	.181	(n)	1	.1865	.011	.126	2	(o)	.012	.170	3 3/16	7/8	F	PF	9 1/4	DFS	39.00	35
36	Packard-Cus. Sup. 8 2006-7-8	8-3 1/16x4 5/8	Al	Als	Au, C, Tp	20.25	3 7/8	.....	.0007	.181	(n)	1	.1865	.011	.126	2	(o)	.012	.170	3 3/16	7/8	F	PF	9 1/4	DFS	39.00	36
37	Plymouth-DeL. & Spec. DL P-14	6-3 1/4x4 3/8	.....	CI	C, Rb	25.29	3 1/2	.0105	(g)	.174	.171	2	5/32	.011	.145	2	3/16	.011	.162	2 3/4	55/64	F	.00040	7 11/16	MFS	.....	37
38	Pontiac-DeLuxe 6 42-25	6-3 3/16x4	Own	CN	Tp	27.04	3 11/16	.0235	.0040	.197	.181	1	3/16	.010	.155	2	3/16	.010	.175	3 1/16	11/16	P	.00030	7 1/16	DFS	36.96	38
39	Pontiac-Stream. 6 42-26	6-3 3/16x4	Own	CN	Tp	27.04	3 11/16	.0235	.0040	.197	.181	1	3/16	.010	.155	2	3/16	.010	.175	3 1/16	11/16	P	.00030	7 1/16	DFS	36.96	39
40	Pontiac-DeLuxe 8 42-27	8-3 1/4x3 3/4	Own	CN	Tp	24.64	3 11/16	.0235	.0050	.188	.158	1	3/16	.012	.150	2	3/16	.012	.150	2 7/8	11/16	P	.00030	7 1/16	DFS	31.68	40
41	Pontiac-Stream. 8 42-28	8-3 1/4x3 3/4	Own	CN	Tp	24.64	3 11/16	.0235	.0050	.188	.158	1	3/16	.012	.150	2	3/16	.012	.150	2 7/8	11/16	P	.00030	7 1/16	DFS	31.68	41
42	Studebaker Champion 6 42	6-3x4	Own	CI	C	.....	2 29/32	.0075	SeF	.170	(s)	1	5/32	.012	.135	2	(t)	.012	(u)	2 5/8	3/4	R	.00020	6 3/4	DFS	20.48	42
43	Studebaker-Commander 6 12A	6-3 1/16x4 3/16	Own	CI	C	.....	3 3/4	.0075	SeF	.185	.172	1	5/32	.012	.150	2	3/16	.012	.155	2 7/8	7/8	R	.00020	8 1/16	DFS	33.30	43
44	Studebaker-President 8 8C	8-3 1/16x4 1/4	Own	CI	C	.....	3 3/4	.0075	SeF	.168	.148	1	1/8	.017	.125	2	1/8	.018	.135	2 5/8	7/8	R	.00020	8	DFS	32.00	44
45	Willys-Americar 442	4-3 1/16x4 3/8	.....	CI	O, Tp	24.00	3 1/16	.011	.0020	.171	.161	1	1/16	.010	.140	2	3/16	.010	.135	2 11/16	11/16	R	.00035	9 3/16	Steel	34.00	45

ABBREVIATIONS:

(a)—Upper .160, Lower .140
(b)—Upper .170, Lower .150
(c)—.0024 Bottom of Skirt
(d)—Top .181; Lower .151
(e)—Upper 3/16; Lower 1/8
(f)—Upper .175; Lower .150
(g)—Bottom of Skirt at Maximum Diameter .0008 to .0018
(h)—No. 1—.127; No. 2—.107
(i)—No. 1—.137; No. 2—.116
(k)—Third .124; Fourth .186
(l)—No. 1—.1867; No. 2—.1617
(m)—No. 1—.1735; No. 2—.1565
(n)—No. 1—.1882; No. 2—.1837
(o)—No. 1—.093; No. 2—.124
(p)—No. 1—.165-.175; No. 2—.140-.150
(r)—No. 1—.152-.162; No. 2—.135-.145
(s)—Top .161 to .168; Middle .146 to .153
(t)—One 3/32; one 1/8
(u)—Top .150, middle .135
A-B—Aluminum Co. of America and Bohn Aluminum & Brass Corp.
Al—Aluminum Industries, Inc.
Al—Aluminum Alloy
Als—Aluminum Alloy with Strut
An—Anodized Finish
AS—Armasteel
Au—Auto-thermic
C—Cam Ground
CI—Cast Iron
CN—Chrome Nickel Alloy Cast Iron
CS—Cast Alloy Steel
CT—Cam Ground, Turbulator Top
DFS—Drop Forged Steel
F—Floating
Fh—Flat Head
Lf—Lubrite Finish
MFS—High Manganese Forging Steel
O—Oval
P—Locked in Piston
PF—Push Fit
R—Locked in Rod
Rb—Ribbed
SeF—Selective Fit
SF—Slip Fit
Sp—Slipper Skirt
Ss—Split Skirt
Tp—Tin Plated
Trs—Transverse Slot
Ts—"T" Slot
Us—"U" Slot

Connecting Rod and Crankshaft Bearings

Line Number	PASSENGER CAR MAKE AND MODEL	CONNECTING ROD BEARINGS: Crankpin Journal Diameter and Length (In.)	Lower Bearing: Material	Average Clearance (In.)	Average End Play (In.)	Type of Shim	Type of Bearing	Rods and Pins Removed from	CRANKSHAFT: Vibration Damper	Counterweights	End Thrust taken by	Amount of End Play (In.)	MAIN BEARINGS: Type	Material	Clearance (In.)	Type of Shim	Diameter and Length: No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Line Number
1	Buick-Special 42-40A	2x1 7/32	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 17/64	2 5/8x1 1/4	2 7/16x1 5/8	2 1/2x1 1/4	2 9/16x1 23/32					1
2	Buick-Ex. Spec. 42-40B	2x1 7/32	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 17/64	2 5/8x1 1/4	2 7/16x1 5/8	2 1/2x1 1/4	2 9/16x1 23/32					2
3	Buick-Super 42-50	2x1 7/32	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 17/64	2 5/8x1 1/4	2 7/16x1 5/8	2 1/2x1 1/4	2 9/16x1 23/32					3
4	Buick-Century 42-60	2 1/4x1 5/16	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 9/32	2 5/8x1 1/2	2 11/16x1 13/16	2 3/4x1 1/2	2 13/16x2 3/32					4
5	Buick-Roadmaster 42-70	2 1/4x1 5/16	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 9/32	2 5/8x1 1/2	2 11/16x1 13/16	2 3/4x1 1/2	2 13/16x2 3/32					5
6	Buick-Limited 42-90	2 1/4x1 5/16	Bab	.0013	.0075	So	Spun	A	Yes	8	C	.006	SI	Du	.0016	So	2 5/8x1 3/8	2 5/8x1 1/2	2 11/16x1 13/16	2 3/4x1 1/2	2 13/16x2 3/32					6
7	Cadillac 61, 62, 63, 60S	2.46x2 1/32	BSb	.0015	.0045	No	Sep	A	Yes	6	C	.003	SI	BSb	.0015	No	2 1/2x1 1/16	2 1/2x1 3/32	2 1/2x1 3/32							7
8	Cadillac 67, 75	2.46x2 1/32	BSb	.0015	.0045	No	Sep	A	Yes	6	C	.003	SI	BSb	.0015	No	2 1/2x1 1/16	2 1/2x1 3/32	2 1/2x1 3/32							8
9	Chevrolet	2.31x1.498	Bab	SF	.0080	So	Spun	A	Yes	7	3	.005	SI	BSb	SF	So	2.683x2.684	2.714x2.717	2.745x2.746	2.776x2.777						9
10	Chrysler-Roy. & Win. C-34	2 1/8x1 7/32	BSb	.0012	.0085	No	Sep	A	Yes	9	R	.005	SI	BSb	.0012	No	2 1/8x1 5/16	2 1/8x1 5/16	2 1/8x1 5/16	2 1/8x1 7/8						10
11	Chrysler-Sar. & N.Y. C-36	2 1/8x1 1/8	BSb	.0012	.0085	No	Sep	A	Yes	8	R	.005	SI	BSb	.0012	No	2 1/8x1 1/32	2 1/8x1 1/8	2 1/8x1 1/16	2 1/8x1 1/8	2 1/8x2 3/32					11
12	Chrysler-Crown Imp. C-37	2 1/8x1 1/8	BSb	.0012	.0085	No	Sep	A	Yes	8	R	.005	SI	BSb	.0012	No	2 1/8x1 1/32	2 1/8x1 1/8	2 1/8x1 1/16	2 1/8x1 1/8	2 1/8x2 3/32					12
13	Crosley '42	3/4x1.00	Bab	.0015	.0072	No	Sep	A	No	4	R	.004	SI	BSb	.0020	No	1 1/8x1 1/4	2 1/4x1 1/2								13
14	De Soto-DeL. & Cust. S-10	2 1/8x1 7/32	BSb	.0012	.0085	No	Sep	A	Yes	7	R	.005	SI	BSb	.0012	No	2 1/8x1 5/8	2 1/8x1 5/8	2 1/8x1 5/8	2 1/8x1 7/8						14
15	Dodge-DeL & Cust. D-22	2 1/16x1 7/8	BSb	.0012	.0085	No	Sep	A	Yes	7	R	.005	SI	BSb	.0012	No	2 1/8x1 11/64	2 1/8x1 3/32	2 1/8x1 3/32	2 1/8x1 7/8						15
16	Ford-Six	2.235x1.40	SA			No	Sep	A		5				SAS		No	2.499x1.295	2.499x1.360	2.499x1.360	2.499x1.295						16
17	Ford-Eight	2.000x1.75	SA			No	Sep	A	No	6	R			SAS		No	2.50x1.37	2.50x1.37	2.50x1.965							17
18	Hudson-Six & DeL. 20	1 1/8x1 3/8	SAE13	.0004	.0100	No	Spun	A	Yes	8	C	.009	SI	BT	.0010	No	2 1/4x1 5/8	2 3/8x1 3/4	2 1/4x2 3/8							18
19	Hudson-Super. & Com. 6 21, 22	1 1/8x1 3/8	SAE13	.0004	.0100	No	Spun	A	Yes	8	C	.009	SI	BT	.0010	No	2 1/4x1 5/8	2 3/8x1 3/4	2 1/4x2 3/8							19
20	Hudson-Com. 8 24, 25	1 1/8x1 3/8	SAE13	.0004	.0100	No	Spun	A	Yes	8	C	.009	SI	BB	.0010	No	2 5/8x1 5/8	2 5/8x1 3/8	2 1/4x1 7/8	2 3/8x1 3/4	2 1/2x2					20
21	Hudson-Com. Cust. 8 27	1 1/8x1 3/8	SAE13	.0004	.0100	No	Spun	A	Yes	8	C	.009	SI	BB	.0010	No	2 5/8x1 5/8	2 7/8x1 3/8	2 1/4x1 7/8	2 3/8x1 3/8	2 1/2x2					21
22	Lincoln-Zeph. & Cont.	2.126x1.75				No	Sep	A			R	.004	SI	SAS		No	2.401x1.625	2.401x1.248	2.401x1.248	2.401x2.248						22
23	Lincoln-Custom	2.126x1.75				No	Sep	A			R	.004	SI	SAS		No	2.401x1.625	2.401x1.248	2.401x1.248	2.401x2.248						23
24	Mercury	2.14x1.75	SA			No	Sep	A		6	R			SAS		No	2.50x1.37	2.50x1.37	2.50x1.97							24
25	Nash-Ambassador 600 42-40	1 7/8x1 1/4	BSb	.0017	.0060	No	Sep	A	Yes	4	F	.004	SI	BSb	.0020	No	2 1/4x1 5/8	2 1/4x1 3/8	2 1/4x1 3/8	2 1/4x1 3/4						25
26	Nash-Ambassador 6 42-60	2.002x1.426	BSb	.0020	.0100	No	Sep	A	Yes	4	C	.004	SI	BSb	.0020	No	2 1/4x1 1/4	2 1/4x1 1/2	2 1/4x1 1/2	2 1/4x1 7/8	2 1/4x1 7/8	2 1/4x1 1/2	2 1/4x1 5/8			26
27	Nash-Ambassador 8 42-80	2.001x1.239	BSb	.0020	.0100	No	Sep	A	Yes	No	C	.004	SI	BSb	.0020	No	2 1/4x1 1/2	2 1/4x1 1/2	2 1/4x1 1/16	2 1/4x1 1/2	2 1/4x1 5/8	2 1/4x1 1/2	2 1/4x1 1/16	2 1/4x1 1/2	2 1/4x2 1/32	27
28	Oldsmobile-Special Six 66	2 1/8x1 1/4	BSb	.0015	.0080	No	Sep	A	Yes	7	F	.006	SI	BSb	.0020	No	2 3/16x1 17/64	2 3/16x1 3/8	2 3/16x1 3/8	2 1/16x1 5/8						28
29	Oldsmobile-Dynamic Six 76	2 1/8x1 1/4	BSb	.0015	.0080	No	Sep	A	Yes	7	F	.006	SI	BSb	.0020	No	2 3/16x1 17/64	2 3/16x1 3/8	2 3/16x1 3/8	2 1/16x1 5/8						29
30	Oldsmobile-Special 8 68	2 1/8x1 1/4	BSb	.0015	.0080	No	Sep	A	Yes	8	F	.006	SI	BSb	.0020	No	2 3/16x1 3/32	2 3/16x1 1/4	2 3/16x1 7/16	2 1/16x1 11/32	2 1/16x1 11/32					30
31	Oldsmobile-Dynamic 8 78	2 1/8x1 1/4	BSb	.0015	.0080	No	Sep	A	Yes	8	F	.006	SI	BSb	.0020	No	2 3/16x1 3/32	2 3/16x1 1/4	2 3/16x1 7/16	2 1/16x1 11/32	2 1/16x1 11/32					31
32	Oldsmobile-Custom 8 98	2 1/8x1 1/4	BSb	.0015	.0080	No	Sep	A	Yes	8	F	.006	SI	BSb	.0020	No	2 3/16x1 3/32	2 3/16x1 1/4	2 3/16x1 7/16	2 1/16x1 11/32	2 1/16x1 11/32					32
33	Packard-Six 2000-2020	2 3/8x1 1/4	Bab	.0010	.0070	No	Sep	A	Yes	6	F	.005	...	BSb	.0010	No	2 3/4x1 1/2	2 3/4x1 1/2	2 3/4x1 1/2	2 3/4x2 1/16						33
34	Packard-Eight 2001-2021	2 3/8x1 1/4	Bab	.0010	.0070	No	Sep	A	Yes	8	C	.005	...	BSb	.0010	No	2 3/4x1 1/2	2 3/4x1 1/2	2 3/4x1 1/2	2 3/4x2 1/16	2 3/4x2 1/16					34
35	Packard-Sup. 8 2003-23-4-5	2 1/4x1 3/8	Bab	.0010	.0070	No	Sep	A	Yes	8	C	.005	...	BSb	.0010	No	2 3/4x1 11/32	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x1 7/16	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x2 1/16	35
36	Packard-Cus. Sup. 8 2006-7-8	2 1/4x1 3/8	Bab	.0010	.0070	No	Sep	A	Yes	8	C	.005	...	BSb	.0010	No	2 3/4x1 11/32	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x1 7/16	2 3/4x1 7/16	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x1 3/8	2 3/4x2 1/16	36
37	Plymouth-DeL. & Spec. DL P-14	2 1/16x1	BSb	.0012	.0085	No	Sep	A	Yes	7	R	.005	SI	BSb	.0012	No	2 1/16x1 13/64	2 1/16x1 3/32	2 1/16x1 3/32	2 1/16x1 7/8						37
38	Pontiac-DeLuxe 6 42-25	2 1/16x1 3/32	WSb	.0016	.0095	No	Sep	A	Yes	9	RC	.005	SI	WSb	.0013	No	2 1/16x1 1/4	2 1/16x1 1/16	2 1/16x1 1/8	2 5/16x1 1/16						38
39	Pontiac-Stream. 6 42-26	2 1/16x1 3/32	WSb	.0016	.0095	No	Sep	A	Yes	9	RC	.005	SI	WSb	.0013	No	2 1/16x1 1/4	2 1/16x1 1/16	2 1/16x1 1/8	2 5/16x1 1/16						39
40	Pontiac-DeLuxe 8 42-27	2x1 1/16	WSb	.0011	.0095	No	Sep	A	Yes	8	RC	.005	SI	WSb	.0013	No	2 1/16x1 1/4	2 1/16x1 1/16	2 1/16x1 1/16	2 1/16x1 1/8	2 1/16x1 7/8					40
41	Pontiac-Stream. 8 42-28	2x1 1/16	WSb	.0011	.0095	No	Sep	A	Yes	8	RC	.005	SI	WSb	.0013	No	2 1/16x1 1/4	2 1/16x1 1/16	2 1/16x1 1/16	2 1/16x1 1/8	2 1/16x1 7/8					41
42	Studebaker Champion 6 4G	1 13/16x1 1/16	Bab	.0012	.0070	No	Spun	A	Yes	4	F	.004	SI	BSb	.0015	No	2 7/16x1 5/8	2 7/16x1 1/16	2 7/16x1 1/16	2 7/16x1 17/64						42
43	Studebaker-Commander 6 '12A	2 3/16x1 3/16	Bab	.0012	.0070	No	Spun	A	Yes	5	F	.004	SI	BSb	.0015	No	2 1/16x1 1/16	2 1/16x1 1/16	2 1/16x1 1/16	2 1/16x1 17/64						43
44	Studebaker-President 8 8C	1 7/8x1 3/16	Clev	.0017	.0075	No	Sep	A	Yes	12	F	.004	SI	BSb	.0011	No	2 1/16x1	2 1/16x 29/32	2 1/16x 29/32	2 1/16x 29/32	2 1/16x1 1/32	2 1/16x 29/32	2 1/16x 29/32	2 1/16x 29/32	2 1/16x1 1/32	44
45	Willys-Americar 442	1.939x1.304	BSb	.0015	.0070	No	Sep	A	No	4	F	.005	SI	BSb	.0010	No	2.334x1.92	2.334x1 13/16	2.334x1 3/4							45

ABBREVIATIONS:

A—Above
Bab—Babbitt
BB—Bronzed backed babbitt
BSb—Babbitt, steel backed
BT—Bronze backed with tin base
C—Center bearing
Clev—Clevite No. 1535
Du—Durex 100
F—Front bearing
No—No or None
R—Rear main bearing
RC—Rear center
SA—Special Alloy
SAS—Special Alloy, steel backed
Sep—Separate
SF—Selective Fit
SI—Slip-in
So—Solid
WSb—White bearing metal alloy, steel backed

Valves, Intake and Exhaust

Line Number	PASSENGER CAR MAKE AND MODEL	INTAKE VALVE: Make	Overall Length (In.)	Head: Material	Head: Overall Diameter (In.)	Seat: Angle (Deg.)	Seat: Inserts Used	Stem Diameter (In.)	Stem to Guide Clearance (In.) Average	Lift Pin	Springs: Pressure (Lb.) Valve Closed	Springs: Pressure (Lb.) Valve Open	Springs: Length (In.) Valve Closed	Springs: Length (In.) Valve Open	Springs: Length (In.) Out of Engine	EXHAUST VALVE: Make	Overall Length (In.)	Head: Material	Head: Overall Diameter (In.)	Seat: Angle (Deg.)	Seat: Inserts Used	Seat: Material	Stem Diameter (In.)	Stem to Guide Clearance (In.) Average	Lift (In.)	Springs: Pressure (Lb.) Valve Closed	Springs: Pressure (Lb.) Valve Open	Springs: Length (In.) Valve Closed	Springs: Length (In.) Valve Open	Springs: Length (In.) Out of Engine	Line Number
1	Buick-Special 42-40A	T-R	5.109	(a)	1.531	45	N	.372	.0025	.348	32†	77†	1.937†	1.593†	2.343†	T-R	5.109	(b)	1.343	45	N	N	.371	.0030	.342	32†	77†	1.937†	1.593†	2.343†	1
2	Buick-Ex. Spec. 42-40B	T-R	5.109	(a)	1.531	45	N	.372	.0025	.348	32†	77†	1.937†	1.593†	2.343†	T-R	5.109	(b)	1.343	45	N	N	.371	.0030	.342	32†	77†	1.937†	1.593†	2.343†	2
3	Buick-Super 42-50	T-R	5.109	(a)	1.531	45	N	.372	.0025	.348	32†	77†	1.937†	1.593†	2.343†	T-R	5.109	(b)	1.343	45	N	N	.371	.0030	.342	32†	77†	1.937†	1.593†	2.343†	3
4	Buick-Century 42-60	T-R	5.250	(a)	1.781	45	N	.372	.0025	.347	32†	77†	1.937†	1.593†	2.343†	T-R	5.250	(b)	1.437	45	N	N	.371	.0030	.348	32†	77†	1.937†	1.593†	2.343†	4
5	Buick-Roadmaster 42-70	T-R	5.250	(a)	1.781	45	N	.372	.0025	.347	32†	77†	1.937†	1.593†	2.343†	T-R	5.250	(b)	1.437	45	N	N	.371	.0030	.348	32†	77†	1.937†	1.593†	2.343†	5
6	Buick-Limited 42-90	T-R	5.250	(a)	1.781	45	N	.372	.0025	.347	32†	77†	1.937†	1.593†	2.343†	T-R	5.250	(b)	1.437	45	N	N	.371	.0030	.348	32†	77†	1.937†	1.593†	2.343†	6
7	Cadillac 61, 62, 63, 60S			3140	1.881	45	N	.342	.0023	.335	63½	145	1.926	1.581	2.210			82120	1.631	45	N	N	.341	.0033	.345	63½	145	1.926	1.581	2.210	7
8	Cadillac 67, 75			3140	1.881	45	N	.342	.0023	.335	63½	145	1.926	1.581	2.210			82120	1.631	45	N	N	.341	.0033	.345	63½	145	1.926	1.581	2.210	8
9	Chevrolet	Own	6.220	ES	1.640	30	N	.341	SF	.294	55	128	1.812	1.500	2.125	Own	4.854	ES	1.468	30	N	N	.340	SF	.312	55	128	1.812	1.500	2.125	9
10	Chrysler-Roy. & Win. C-34		4.781		1.906	45	N	.340	.0025	.375	42	111	1.750	1.375	2.000		4.781	Sil	1.531	45	Y	SA	.340	.0030	.375	42	111	1.750	1.375	2.000	10
11	Chrysler-Sar. & N.Y. C-36	Al	5.875	3140	1.531	45	N	.340	.0025	.375	55	133	2.031	1.656	2.390		5.875	Sil	1.343	45	Y	SA	.340	.0030	.375	55	133	2.031	1.656	2.390	11
12	Chrysler-Crown Imp. C-37	Al	5.875	3140	1.531	45	N	.340	.0025	.375	55	133	2.031	1.656	2.390		5.875	Sil	1.343	45	Y	SA	.340	.0030	.375	55	133	2.031	1.656	2.390	12
13	Crosley '42	Al	5.703	3140	1.375	45	N	.311	.0020	.300	20	41	1.500	1.203	1.500	Al	5.734	Dia-9	1.156	45	N	N	.310	.0030	.300	20	41	1.500	1.203	1.500	13
14	De Soto-DeL. & Cust. S-10	Al	4.781	3140	1.718	45	N	.340	.0025	.375	42	111	1.750	1.375	2.000		4.781	Sil	1.531	45	Y	SA	.340	.0030	.375	42	111	1.750	1.375	2.000	14
15	Dodge-DeL. & Cust. D-22		4.781		1.531	45	N	.340	.0020	.375	42	111	1.750	1.375	2.000		4.781	Sil	1.406	45	Y	SA	.340	.0040	.375	42	111	1.750	1.375	2.000	15
16	Ford-Six	Own		CA	1.620	45		.310	.0025		38½	78			2.130	Own		CM	1.484	45	Y	CM	.310	.0025		38½	78			2.130	16
17	Ford-Eight	Own		CA	1.510	45	Y	.310	.0025	.292	38½	78			2.130	Own		CM	1.510	45	Y	CM	.310	.0025	.292	38½	78			2.130	17
18	Hudson-Six & DeL. 20	WR	5.343	3140	1.375	45	N	.341	.0022	.343	40	80			2.343	WR	5.344	Sil-X	1.375	45	N	N	.339	.0040	.343	40	80			2.343	18
19	Hudson-Super. & Com. 6 21, 22	WR	5.343	3140	1.375	45	N	.341	.0022	.343	40	80			2.343	WR	5.344	Sil-X	1.375	45	N	N	.339	.0040	.343	40	80			2.343	19
20	Hudson-Com. 8 24, 25	WR	5.093	3140	1.500	45	N	.341	.0022	.343	40	80			2.343	WR	5.094	Sil-X	1.437	45	N	N	.339	.0040	.343	40	80			2.343	20
21	Hudson-Com. Cust. 8 27	WR	5.093	3140	1.500	45	N	.341	.0022	.343	40	80			2.343	WR	5.094	Sil-X	1.375	45	N	N	.339	.0040	.343	40	80			2.343	21
22	Lincoln-Zeph. & Cont.	Own			1.537	45	N	.311	.0025	.292	54	116			2.130	Own			1.537	45	Y	CM	.311	.0025	.292	54	116			2.130	22
23	Lincoln-Custom	Own			1.537	45	N	.311	.0025	.292	54	116			2.130	Own			1.537	45	Y	CM	.311	.0025	.292	54	116			2.130	23
24	Mercury	Own		CA	1.510	45	Y	.310	.0025	.292	38½	78			2.130	Own		CM	1.510	45	Y	CM	.310	.0025	.292	38½	78			2.130	24
25	Nash-Ambassador 600 42-40		4.800	CN	1.343	45	N	.341	.0025	.312	39	83	1.750	1.437	2.093		4.800		1.281	45	N	N	.341	.0050	.312	39	83	1.750	1.437	2.093	25
26	Nash-Ambassador 6 42-60	WR	5.531	CN	1.750	45	N	.372	.0030	.343	38*	95*	1.687*	1.343*	2.000*	WR	5.531	Sil-X	1.593	45	N	N	.372	.0030	.343	38*	95*	1.687*	1.343*	2.000*	26
27	Nash-Ambassador 8 42-80	WR	5.500	CN	1.656	45	N	.372	.0030	.343	38*	95*	1.687*	1.343*	2.000*	WR	5.500	Sil-X	1.468	45	N	N	.372	.0030	.343	38*	95*	1.687*	1.343*	2.000*	27
28	Oldsmobile-Special Six 66	Var	5.796	1050A	1.562	30	N	.342	.0027	.300	50½	95½	2.250	1.937	2.593	Var	5.796		1.421	45	N	N	.341	.0033	.300	50½	95½	2.250	1.937	2.593	28
29	Oldsmobile-Dynamic Six 76	Var	5.796	1050A	1.562	30	N	.342	.0027	.300	50½	95½	2.250	1.937	2.593	Var	5.796		1.421	45	N	N	.341	.0033	.300	50½	95½	2.250	1.937	2.593	29
30	Oldsmobile-Special 8 68	Var	5.796	1050A	1.562	30	N	.342	.0027	.300	50½	95½	2.250	1.937	2.593	Var	5.796		1.421	45	N	N	.341	.0033	.300	50½	95½	2.250	1.937	2.593	30
31	Oldsmobile-Dynamic 8 78	Var	5.796	1050A	1.562	30	N	.342	.0027	.300	50½	95½	2.250	1.937	2.593	Var	5.796		1.421	45	N	N	.341	.0033	.300	50½	95½	2.250	1.937	2.593	31
32	Oldsmobile-Custom 8 98	Var	5.796	1050A	1.562	30	N	.342	.0027	.300	50½	95½	2.250	1.937	2.593	Var	5.796		1.421	45	N	N	.341	.0033	.300	50½	95½	2.250	1.937	2.593	32
33	Packard-Six 2000-2020	WR	5.619	CN	1.593	30	N	.340	.0025	.318	54½	124	1.625	1.312		WR	5.619	Sil-X	1.375	45			.340	.0045	.317	54½	124	1.625	1.312		33
34	Packard-Eight 2001-2021	WR	5.619	CN	1.484	30	N	.340	.0025	.318	54½	124	1.625	1.312		WR	5.619	Sil-X	1.375	45			.340	.0045	.317	54½	124	1.625	1.312		34
35	Packard-Sup. 8 2003-23-4-5	WR	6.224	CN	1.687	30	N	.340	.0020	.340	63	140	1.750	1.406		WR	6.224	Sil-X	1.437	45			.340	.0040	.340	63	140	1.750	1.406		35
36	Packard-Cus. Sup. 8 2006-7-8	WR	6.224	CN	1.687	30	N	.340	.0020	.340	63	140	1.750	1.406		WR	6.224	Sil-X	1.437	45			.340	.0040	.340	63	140	1.750	1.406		36
37	Plymouth-DeL. & Spec. DL. P-14		4.781		1.531	45	N	.340	.0020	.375	42	111	1.750	1.375	2.000		4.781	Sil	1.406	45	Y	SA	.340	.0040	.375	42	111	1.750	1.375	2.000	37
38	Pontiac-DeLuxe 6 42-25	Own	5.718	CS	1.593	30	N	.312	FF	.296	59½	101	1.906	1.593		Own	5.718	CNS	1.468	45	N	N	.312	FF	.296	59½	101	1.906	1.593		38
39	Pontiac-Stream. 6 42-26	Own	5.718	CS	1.593	30	N	.312	FF	.296	59½	101	1.906	1.593		Own	5.718	CNS	1.468	45	N	N	.312	FF	.296	59½	101	1.906	1.593		39
40	Pontiac-DeLuxe 8 42-27	Own	5.531	CS	1.468	30	N	.312	FF	.296	59½	101	1.906	1.593		Own	5.531	CNS	1.343	45	N	N	.312	FF	.296	59½	101	1.906	1.593		40
41	Pontiac-Stream. 8 42-28	Own	5.531	CS	1.468	30	N	.312	FF	.296	59½	101	1.906	1.593		Own	5.531	CNS	1.343	45	N	N	.312	FF	.296	59½	101	1.906	1.593		41
42	Studebaker Champion 6 4G	A-R	4.343	CN	1.343	45	N	.312	.0022	.312	54	92	1.656	1.343	2.093	A-R	4.343	2112	1.281	45	N	N	.312	.0025	.312	54	92	1.656	1.343	2.093	42
43	Studebaker-Commander 6 12A	WR	5.218	CN	1.468	45	N	.343	.0025	.343	56	130	2.093	1.750	2.500	WR	5.218	Sil-1	1.281	45	N	N	.343	.0025	.343	56	130	2.903	1.750	2.500	43
44	Studebaker-President 8 8C	WR	5.218	CN	1.406	45	N	.343	.0020	.343	56	130	2.093	1.750	2.500	WR	5.218	Sil-1	1.281	45	N	N	.343	.0020	.343	56	130	2.093	1.750	2.500	44
45	Willys-Americar 442	Var	5.750	(a)	1.531	45	N	.373	.0023	.718	50	116	2.109	1.750	2.500	Var	5.750	CN	1.468	45	N	N	.372	.0028	.359	50	116	2.109	1.750	2.500	45

ABBREVIATIONS:

†—Outer only
Inner—20 lbs., 1 13/16 in., valve closed
51 lbs., 1 1/16 in., valve open
Out of engine 1 3/16

*—Outer only
Inner—21 lbs., 1.375 in., valve closed
51 lbs., 1.031 in., valve open
1.656 in., out of engine

(a)—3140 or 1050
(b)—X.C.R. or 82172

Al—Aluminum Industries, Inc.
A-R—Aluminum Industries or Wilcox-Rich
CA—Chrome Alloy
CM—Chrome-Molybdenum
CN—Chrome Nickel Steel
CNS—Chrome-Nickel-Silicon

CS—Chrome-Silicon Steel
Dia—Diachrome
ES—Extruded Steel
FF—Free Fit to .0006 Max.
N—No or None
SA—Special Alloy

SF—Selective Fit
Sil—Silchrome
T-R—Thompson Products or Wilcox-Rich Division
Var—Various
WR—Wilcox-Rich Division
Y—Yes

Fuel and Cooling Systems

Line Number	PASSENGER CAR MAKE AND MODEL	FUEL SYSTEMS: Tank Capacity (Gal.)	FEED: Type	FEED: Make	CARBURETOR: Make	CARBURETOR: Number Used and Model No.	CARBURETOR: Size	CARBURETOR: Type	Manifold Heat Control	Automatic Choke—Make	Air Cleaner—Make	Muffler—Make	WATER PUMP: Type	WATER PUMP: Drive	WATER PUMP: Packing Nut?	Thermostat—Make	Pressure Relief Valve	By-pass for Recirculation	RADIATOR CORE: Type	RADIATOR CORE: Make	System Capacity (Qts.)	Full Length Water Jackets	LOWER HOSE: Inside Diameter (In.)	LOWER HOSE: Length	UPPER HOSE: Inside Diameter (In.)	UPPER HOSE: Length	FAN BELT: Angle of Vee (Deg.)	FAN BELT: Length—Outside (In.)	FAN BELT: Width—Max. (In.)	Fan Make	Line Number
1	Buick-Special 42-40A	19	CP	AC	S-C	1—(a)	1	DD	Au	S-C	AC	Hay	Ce	B	N	Har	Y	Y	Cel	Har	13	No	1 5/16	ET	1 5/16	ET	.....	.....	.....	Hay	1
2	Buick-Ex. Spec. 42-40B	19	CP	AC	S-C	1—(a)	1	DD	Au	S-C	AC	Hay	Ce	B	N	Har	Y	Y	Cel	Har	13	No	1 5/16	ET	1 5/16	ET	.....	.....	.....	Hay	2
3	Buick-Super 42-50	19	CP	AC	S-C	2—(b)	1	DD	Au	S-C	A-H	Hay	Ce	B	N	Har	Y	Y	Cel	Har	13	No	1 5/16	ET	1 5/16	ET	.....	.....	.....	Hay	3
4	Buick-Century 42-60	19	CP	AC	S-C	2—(c)	1	DD	Au	S-C	A-H	Hay	Ce	B	N	Har	Y	Y	Cel	Har	16 3/4	No	1 1/16	ET	1 1/16	ET	.....	.....	.....	Hay	4
5	Buick-Roadmaster 42-70	19	CP	AC	S-C	2—(c)	1	DD	Au	S-C	A-H	Hay	Ce	B	N	Har	Y	Y	Cel	Har	16 3/4	No	1 1/16	ET	1 1/16	ET	.....	.....	.....	Hay	5
6	Buick-Limited 42-90	22	CP	AC	S-C	2—(c)	1	DD	Au	S-C	A-H	Hay	Ce	B	N	Har	Y	Y	Cel	Har	18	No	1 1/16	ET	1 1/16	ET	.....	.....	.....	Hay	6
7	Cadillac 61, 62, 63, 60S	20	CP	AC	S-C	1—(m)	1	DD	Au	Str	AC	Wal	Ce	B	Y	Dole	....	Y	TF	Har	25	Yes	2	Mo	1 1/4	(d)	34	35 1/2	1 1/64	Hay	7
8	Cadillac 67, 75	20-24	CP	AC	S-C	1—(m)	1	DD	Au	Str	AC	Wal	Ce	B	Y	Dole	....	Y	TF	Har	25	Yes	2	Mo	1 1/4	(d)	34	35 1/2	1 1/64	Hay	8
9	Chevrolet	16	CP	AC	Car	1—W1-483S	1 1/4	SD	Au	N	AC	Var	Ce	B	N	Har	N	N	Cel	Har	15	Yes	1 1/2	8 7/8	1 1/4	6 3/4	32	42 7/8	11/16	Own	9
10	Chrysler-Roy. & Win. C-34	17	CP	AC	Car	1—EE1	1 1/2	SD	Au	Sis	AC	.....	Ce	B	N	F-B	Y	Y	Cel	Jam	18	Yes	1 3/4	6 1/2	1 1/2	9 1/4	40	48 5/8	3/4	.....	10
11	Chrysler-Sar. & N.Y. C-36	20	CP	AC	Str	1—AAV-2	1 1/4	DD	Au	Str	AC	.....	Ce	B	N	F-B	Y	Y	TF	Jam	26	Yes	1 3/4	5 3/4	1 3/4	9	40	48 5/8	3/4	.....	11
12	Chrysler-Crown Imp. C-37	20	CP	AC	Str	1—AAV-2	1 1/4	DD	Au	Str	AC	.....	Ce	B	N	F-B	Y	Y	TF	Jam	26	Yes	1 3/4	5 3/4	1 3/4	9	40	48 5/16	3/4	.....	12
13	Crosley '42	6	CP	AC	Til	1—DY-1A	7/8	SD	No	No	AC	Own	(e)	(e)	...	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Wau	13
14	De Soto-DeL. & Cust. S-10	17	CP	AC	Car	1—EE1	1 1/2	SD	Au	Sis	AC	.....	Ce	B	N	F-B	N	Y	Cel	Jam	18	Yes	1 3/4	6	1 3/4	9 1/4	40	48 5/8	3/4	.....	14
15	Dodge-DeL. & Cust. D-22	17	CP	AC	Str	1—BXV-3	1 1/2	SD	Au	Sis	AC	.....	Ce	B	N	F-B	N	Y	Cel	Fed	15	Yes	1 3/4	6	1 1/2	9 1/4	40	49 1/4	3/4	.....	15
16	Ford-Six	17	CP	AC	Own	1—	1 3/16*	SD	Au	No	.....	Own	Ce	B	...	F-B	.....	.....	TF	.....	17 1/2	Yes	1 1/2	Mo	1 1/2	Mo	28	36†	3/4	.....	16
17	Ford-Eight	17	CP	AC	Own	1—	.94*	DD	Au	No	.....	Own	Ce	B	...	F-B	.....	.....	TF	Mc	22	Yes	1 3/4	Mo	1 3/4	Mo	28	36†	3/4	.....	17
18	Hudson-Six & DeL. 20	12 1/2	CP	AC	Car	1—WA1-454S	1 1/4	SD	Man	Car	AC	Old	Ce	B	N	Ful	N	N	Cel	Mc	13	No	1 5/8	8 1/2	1 1/2	10	48	44.6†	.79	Own	18
19	Hudson-Super. & Com. 6 21, 22	16 1/2	CP	AC	Car	1—WDO-501S	1	DD	Au	Car	AC	Old	Ce	B	N	Ful	N	N	Cel	Mc	13	No	1 5/8	8 1/2	1 1/2	10	46	44.6†	.79	Own	19
20	Hudson-Com. 8 24, 25	16 1/2	CP	AC	Car	1—WDO-502S	1 1/4	DD	Au	Car	AC	Old	Ce	B	N	Ful	N	(f)	Cel	Mc	18	No	1 5/8	10	1 1/2	7 3/4	46	44.6†	.79	Own	20
21	Hudson-Com. Cust. 8 27	16 1/2	CP	AC	Car	1—WDO-502S	1 1/4	DD	Au	Car	AC	Old	Ce	B	N	Ful	N	Y	Cel	Mc	18	No	1 5/8	10	1 1/2	7 3/4	46	44.6†	.79	Own	21
22	Lincoln-Zeph. & Cont.	19 1/2	CP	AC	Own	1—	1*	DD	Au	No	.....	Own	Ce	B	...	Ful	.....	.....	Cel	Mc	26 1/2	Yes	1 3/4	Mo	1 3/4	Mo	28	.....	.....	Own	22
23	Lincoln-Custom	19 1/2	CP	AC	Own	1—	1*	DD	Au	No	.....	Own	Ce	B	...	Ful	.....	.....	Cel	Mc	26 1/2	Yes	1 3/4	Mo	1 3/4	Mo	28	.....	.....	Own	23
24	Mercury	17	CP	AC	Own	1—	.94*	DD	Au	No	.....	Own	Ce	B	...	Ful	.....	.....	TF	.....	21 1/4	Yes	1 3/4	Mo	1 3/4	Mo	28	36	3/4	Own	24
25	Nash-Ambassador 600 42-40	20	CV	AC	Car	1—WDO-513S	1 1/4	SD	Au	No	AC	Wal	Ce	B	Y	Har	...	N	TF	Mc	14	Yes	1 1/2	6 1/4	1 1/2	7 3/4	32	41 13/16	25/32	Sch	25
26	Nash-Ambassador 6 42-60	20	CV	AC	Car	1—WA1-462S	1 1/4	SD	Au	Car	AC	Wal	Ce	B	Y	Har	...	N	TF	Mc	17	Yes	1 1/2	6 1/2	1 1/4	7 3/4	32	42 3/16	25/32	Sch	26
27	Nash-Ambassador 8 42-80	20	CP	AC	Car	1—WDO-538S	1	DD	.....	Car	AC	Wal	Ce	B	Y	Ful	N	N	TF	Mo	16	Yes	1 1/2	6 1/2	1 1/2	7 3/4	32	45	25/32	Sch	27
28	Oldsmobile-Special Six 66	19	CP	AC	Car	1—W1-523S	1 1/2	SD	Au	Car	AC	Var	Ce	B	N	Har	N	Y	Cel	Har	18 1/2	Yes	1 3/4	13	1 1/2	8	32	44 11/16	13/32	Own	28
29	Oldsmobile-Dynamic Six 76	19	CP	AC	Car	1—W1-523S	1 1/2	SD	Au	Car	AC	Var	Ce	B	N	Har	N	Y	Cel	Har	18 1/2	Yes	1 3/4	13	1 1/2	8	32	44 11/16	13/32	Own	29
30	Oldsmobile-Special 8 68	19	CP	AC	Car	1—WDO-	1 1/4	DD	Au	Car	AC	Var	Ce	B	N	Har	N	Y	Cel	Har	20 1/2	Yes	1 3/4	15	1 1/2	7 1/4	32	44 11/16	13/32	Own	30
31	Oldsmobile-Dynamic 8 78	19	CP	AC	Car	1—WDO-	1 1/4	DD	Au	Car	AC	Var	Ce	B	N	Har	N	Y	Cel	Har	20 1/2	Yes	1 3/4	15	1 1/2	7 1/4	32	44 11/16	13/32	Own	31
32	Oldsmobile-Custom 8 98	19	CP	AC	Car	1—	1 1/4	DD	Au	Car	AC	Var	Ce	B	N	Har	N	Y	Cel	Har	20 1/2	Yes	1 3/4	15	1 1/2	7 1/4	32	44 11/16	13/32	Own	32
33	Packard-Six 2000-2020	17	CP	AC	Car	1—WA1-530S	1 1/4	SD	Au	Car	AC	.....	Ce	B	...	Ful	Y	.....	(h)	H-M	(i)	.....	1 3/4	12 5/8	1 3/4	(k)	42	49 1/4	3/4	Own	33
34	Packard-Eight 2001-2021	(g)	CP	AC	Car	1—WDO-512S	1	DD	Au	Car	AC	.....	Ce	B	...	Ful	Y	.....	TF	Mc	17	.....	1 3/4	12 5/8	1 3/4	(k)	42	49 1/4	3/4	.....	34
35	Packard-Sup. 8 2003-23-4-5	20	CP	AC	Car	1—WDO-531S	1 1/4	DD	Au	Car	AC	.....	Ce	B	...	B&B	Y	.....	TF	Mc	20	.....	1 3/4	11 1/2	1 3/4	(k)	42	52 1/4	1	.....	35
36	Packard-Cus. Sup. 8 2006-7-8	20	CP	AC	Car	1—WDO-531S	1 1/4	DD	Au	Car	AC	.....	Ce	B	...	B&B	Y	.....	TF	Mc	20	.....	1 3/4	11 1/2	1 3/4	(k)	42	52 1/4	1	.....	36
37	Plymouth-DeL. & Spec. DL. P-14	17	CP	AC	Car	1—D6G1	1 1/2	SD	Au	No	AC	.....	Ce	B	N	F-B	N	Y	Cel	F-J	15	Yes	1 3/4	6 1/4	1 1/2	8 3/4	40	49 11/16	3/4	.....	37
38	Pontiac-DeLuxe 6 42-25	17	CP	AC	Car	1—W1-521S	1 1/4	SD	Au	Car	AC	Var	Ce	B	N	Har	Y	Y	Cel	Har	18	Yes	1 1/2	16 1/2	1 3/4	13 1/2	32	48 1/4	3/4	Own	38
39	Pontiac-Stream. 6 42-26	17	CP	AC	Car	1—W1-521S	1 1/4	SD	Au	Car	AC	Var	Ce	B	N	Har	Y	Y	Cel	Har	18	Yes	1 1/2	16 1/2	1 3/4	13 1/2	32	48 1/4	3/4	Own	39
40	Pontiac-DeLuxe 8 42-27	17	CP	AC	Car	1—WDO-540S	1 1/4	DD	Au	Car	AC	Var	Ce	B	N	Har	Y	Y	Cel	Har	19 1/2	Yes	1 1/2	13 1/8	1 3/4	8 1/2	32	48 1/4	3/4	Own	40
41	Pontiac-Stream. 6 42-28	17	CP	AC	Car	1—WDO-540S	1 1/4	DD	Au	Car	AC	Var	Ce	B	N	Har	Y	Y	Cel	Har	19 1/2	Yes	1 1/2	13 1/8	1 3/4	8 1/2	32	48 1/4	3/4	Own	41
42	Studebaker Champion 6 4G	15	CP	AC	Car	1—WA1-496S	1 1/4	SD	Au	Car	AC	Wal	Ce	B	N	B&B	N	N	Cel	Mc	10 1/2	Yes	1 1/2	Mo	1 1/4	8 1/4	44	38 1/4	11/16	H-S	42
43	Studebaker-Commander 6 12A	18	CP	AC	Str	1—BXOV-26	1 1/4	SD	Au	Str	AC	Wal	Ce	B	Y	F-B	N	Y	TF	Mc	13	Yes	1 3/4	Mo	1 1/4	11 1/2	42	44 7/8†	25/32	Hay	43
44	Studebaker-President 8 8C	18	CP	AC	Str	1—AAV-26	1 1/4	DD	Au	Str	AC	Wal	Ce	B	N	Ful	N	N	TF	Mc	15	Yes	1 3/4	Mo	1 1/4	12 13/16	42	47 7/8†	25/32	Hay	44
45	Willys-Americar 442	11 1/2	CP	AC	Car	1—WO-507S	1 1/4	SD	Au	No	AC	McK	Ce	B	N	Har	N	N	Cel	Jam	11 3/4	Yes	1 7/16	9	1 1/2	10	42	44 11/16	21/32	Hay	45

ABBREVIATIONS:

*—Venturi size
†—Inside length
(a)—Stromberg AAV-16; Carter WCD-487S
(b)—Front—Stromberg AAV-16; Carter WCD-528S
Rear—Stromberg AA-1; Carter WCD-529S
(c)—Front—Stromberg AAV-16; Carter WCD-533S
Rear—Stromberg AA-1; Carter WCD-534S
(d)—R.H. 13 5/8, L.H. 12 5/8 in.
(e)—Air cooled by means of blower integral with fly wheel
(f)—Model 24—no, Model 25—yes
(g)—17 gal.—2001; 20 gal.—2021
(h)—Tubular—2000; Cellular—2020
(i)—3 1/2 gal.—2000; 3 3/4 gal.—2020
(k)—3 3/4 in.—2000-1-3-6. 3 in. on all other models
(m)—Stromberg AAV-26; Carter 486S
AC—AC Spark Plug Div.
A-H—AC Spark Plug Div. and Hayes Industries
Au—Automatic
B—Belt
B&B—Bishop & Babcock Mfg. Co.
Car—Carter Carburetor Co.
Ce—Centrifugal
Cel—Cellular
CP—Camshaft pump
CV—Camshaft vacuum pump
DD—Dual downdraft
ET—Elbow type
F-B—Fulton or Bishop & Babcock
Fed—Fedders Mfg. Co.
F-J—Fedders or Jamestown
Ful—Fulton Sylphon
Har—Harrison Radiator Div.
Hay—Hayes Industries
H-M—Harrison or McCord
H-S—Hayes or Schweitzer-Cummins
Jam—Jamestown Metal Equipment Co.
Man—Manual
Mc—McCord Radiator Co.
McK—MacKenzie Muffler Co.
Mo—Molded
N—No or None
Old—Oldberg Mfg. Co.
S-C—Stromberg or Carter
Sch—Schweitzer-Cummins
SD—Single downdraft
Sis—Sisson-Pierce Governor Co.
Str—Stromberg Carburetor Div.
TF—Tube and fin
Til—Tillotson Mfg. Co.
Var—Various
Wal—Walker Mfg. Co.
Wau—Waukesha Motor Co.
Y—Yes

Ignition System and Battery

Line Number	PASSENGER CAR MAKE AND MODEL	IGNITION UNIT: Make	Model	Max. Centrifugal Advance (Deg.) at What Engine R.P.M.	Inches Mercury for start of Vacuum Advance (±1 In.)	Max. Vacuum Advance (Deg.) at Inches of Mercury	POINTS: Gap (In.)	POINTS: Arm Tension (Oz.)	Cam Angle (Deg.)	TIMING: Spark Occurs Deg.—TDC	TIMING: Marks On	TIMING: Firing Order	COIL: Amperage Draw, Engine Stopped	COIL: Amperage Draw, Engine Idling	Ignition Lock Make	SPARK PLUGS: Make	SPARK PLUGS: Model	SPARK PLUGS: Thread Size	SPARK PLUGS: Gap (In.)	Ignition Cable Make	BATTERY: Make	BATTERY: Capacity—Amp. Hrs. at 20 hr. Rate	BATTERY: Plates per Cell	BATTERY: Bench Charging Rate, Start (Amp.)	BATTERY: Bench Charging Rate, Finish (Amp.)	Terminal Grounded	Location	Line Number
1	Buick-Special 42-40A	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	4BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	1
2	Buick-Ex. Spec. 42-40B	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	4BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	2
3	Buick-Super 42-50	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	6BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	3
4	Buick-Century 42-60	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	6BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.023	Pak	DR	120	17	7.0	.....	Neg	UH	4
5	Buick-Roadmaster 42-70	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	6BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.025	Pak	DR	120	17	7.0	.....	Neg	UH	5
6	Buick-Limited 42-90	DR	1110801	26–3000	6.00	12@13	.015	19–23	31	6BT	Fly	1,6,2,5,8,3,7,4	4.5	2.5	D-B	AC	46	14	.025	Pak	DR	120	17	7.0	.....	Neg	UH	6
7	Cadillac 61, 62, 63, 60S	DR	1110807	24–4000	.....	18@18	.015	19–23	31	5BT	TD	1,8,7,3,6,5,4,2	4.4	2.2	DR	AC	104	10	.030	Pak	DR	115	17	10.0	8.0	Pos	RF	7
8	Cadillac 67, 75	DR	1110807	24–4000	.....	18@18	.015	19–23	31	5BT	TD	1,8,7,3,6,5,4,2	4.4	2.2	DR	AC	104	10	.030	Pak	DR	115	17	10.0	8.0	Pos	RF	8
9	Chevrolet	DR	1110090	39.5–3450	7.00	20@20	.018	17–21	38	5BT	Fly	1,5,3,6,2,4	4.5	2.5	DR	AC	104	10	.040	DR	DR	100	15	7.0	.....	Neg	RF	9
10	Chrysler-Roy. & Win. C-34	AL	IGS-4202B-1	24–3060	5.00	18@15	.020	17–20	38	2AT	VD	1,5,3,6,2,4	5.0	2.25	YT	AL	A7	14	.025	.....	Wil	120	17	.....	.....	Pos	LF	10
11	Chrysler-Sar. & N.Y. C-36	AL	IGS-4201B-1	24–3500	5.00	20@16	.017	17–20	27	.....	VD	1,6,2,5,8,3,7,4	5.0	2.25	YT	AL	A7	14	.025	.....	AL	135	19	.....	.....	Pos	LF	11
12	Chrysler-Crown Imp. C-37	AL	IGT-4201B-1	24–3500	5.00	20@16	.017	17–20	27	.....	VD	1,6,2,5,8,3,7,4	5.0	2.25	YT	AL	A7	14	.025	.....	AL	135	19	.....	.....	Pos	LF	12
13	Crosley '42	AL	IGW-4142	23–2600	.....	.....	.020	17–20	46	TC	Fly	1,2	5.0	2.25	Dg	AL	A5	14	.030	.....	AL	80	13	.....	.....	.....	RF	13
14	De Soto-DeL. & Cust. S-10	AL	IGS-4202C-1	22–2800	5.00	16@16	.020	17–20	38	4AT	VD	1,5,3,6,2,4	5.0	2.25	YT	AL	A7	14	.025	.....	Wil	105	15	.....	.....	Pos	LF	14
15	Dodge-DeL. & Cust. D-22	AL	IGS-4203B-1	20–2300	5.00	17@16	.020	17–20	38	2AT	VD	1,5,3,6,2,4	5.0	2.25	YT	AL	A7	14	.025	.....	AL	105	15	.....	.....	Pos	LF	15
16	Ford-Six	Own	.....	.....	.....	.....	.015	.....	.....	.....	.....	.....	.....	.....	.....	CH	H-9	14	.025	Ex	Own	120	17	10.0	8.0	Pos	UH	16
17	Ford-Eight	Own	.....	20–3000	.....	.....	.015	20–24	.....	4BT	DH	1,5,4,8,6,3,7,2	.....	.....	Mit	CH	H-9	14	.025	Ex	Own	120	17	10.0	8.0	Pos	UH	17
18	Hudson-Six & DeL. 20	AL	IGW-4203A	23.5–3140	6.75	15@10	.020	17–20	35	(b)	Fly	1,5,3,6,2,4	4.5	2.50	Mit	CH	J-9	14	.038	Ex	Nat	96	17	.....	.....	Pos	LF	18
19	Hudson-Super. & Com. 6 21, 22	AL	IGW-4203A	23.5–3140	6.75	15@10	.020	17–20	35	(b)	Fly	1,5,3,6,2,4	4.5	2.50	Mit	CH	J-9	14	.038	Ex	Nat	96	17	.....	.....	Pos	LF	19
20	Hudson-Com. 8 24, 25	AL	IGP-4008A	35–3400	.....	15@10	.017	17–20	27	TC	Fly	1,6,2,5,8,3,7,4	4.5	2.50	Mit	CH	J-9	14	.038	Ex	Nat	108	19	.....	.....	Pos	LF	20
21	Hudson-Com. Cust. 8 27	AL	IGP-4008A	35–3400	.....	15@10	.017	17–20	27	TC	Fly	1,6,2,5,8,3,7,4	4.5	2.50	Mit	CH	J-9	14	.038	Ex	Nat	108	19	.....	.....	Pos	LF	21
22	Lincoln-Zeph. & Cont.	Own	.....	.....	.....	.....	.....	.....	.....	.....	DH	1,4,9,8,5,2,11,10,3,6,7,12	.....	.....	.....	CH	H-9	14	.025	.....	.....	120	17	10.0	8.0	.....	UH	22
23	Lincoln-Custom	Own	.....	.....	.....	.....	.....	.....	.....	.....	DH	1,4,9,8,5,2,11,10,3,6,7,12	.....	.....	.....	CH	H-9	14	.025	.....	.....	120	17	10.0	8.0	.....	UH	23
24	Mercury	Own	.....	20–3000	.....	.....	.015	20–24	.....	4BT	DH	1,5,4,8,6,3,7,2	.....	.....	.....	CH	H-9	14	.025	Ex	Own	120	17	10.0	8.0	Pos	UH	24
25	Nash-Ambassador 600 42-40	DR	1110512	20–2400	.....	17@17	.021	17–21	35	TC		1,5,3,6,2,4	.....	.....	.....	AL	AN7	14	.025	.....	AL	90	13	.....	.....	Pos	UF	25
26	Nash-Ambassador 6 42-60	AL	IGS-4205	18–1800	5.00	12@15	.020	17–20	38	4BT	VD	1,5,3,6,2,4	5.0	.....	BS	AC	45	14	.025	.....	AL	105	15	.....	.....	Pos	UF	26
27	Nash-Ambassador 8 42-80	AL	IGT-4202	25–3800	14.00	12@17	.017	17–20	27	7BT	VD	1,6,2,5,8,3,7,4	5.0	.....	BS	AC	45	14	.025	.....	AL	120	17	.....	.....	Pos	UF	27
28	Oldsmobile-Special Six 66	DR	1110213	24–3200	.....	12@17	.021	17–21	31	TC	Fly	1,5,3,6,2,4	4.5	2.00	DR	AC	44	14	.040	Pak	DR	100	15	12.5	4.5	Neg	UH	28
29	Oldsmobile-Dynamic Six 76	DR	1110213	24–3200	.....	12@17	.021	17–21	31	TC	Fly	1,5,3,6,2,4	4.5	2.00	DR	AC	44	14	.040	Pak	DR	100	15	12.5	4.5	Neg	UH	29
30	Oldsmobile-Special 8 68	DR	1110808	24–3200	.....	12@17	.015	19–23	31	2BT	Fly	1,6,2,5,8,3,7,4	4.5	2.00	DR	AC	44	14	.030	Pak	DR	120	17	12.5	5.25	Neg	UH	30
31	Oldsmobile-Dynamic 8 78	DR	1110808	24–3200	.....	12@17	.015	19–23	31	2BT	Fly	1,6,2,5,8,3,7,4	4.5	2.00	DR	AC	44	14	.030	Pak	DR	120	17	12.5	5.25	Neg	UH	31
32	Oldsmobile-Custom 8 98	DR	1110808	24–3200	.....	12@17	.015	19–23	31	2BT	Fly	1,6,2,5,8,3,7,4	4.5	2.00	DR	AC	44	14	.030	Pak	DR	120	17	12.5	5.25	Neg	UH	32
33	Packard-Six 2000-2020	(a)	(a)	20.5–3200	6.00	15@17	.020	17–21	35	4BT	Fly	1,5,3,6,2,4	5.0	2.25	BS	(c)	(c)	10	.028	.....	W-A	100	15	.....	.....	Pos	UH	33
34	Packard-Eight 2001-2021	AL	IGP-4502A	21.5–3100	10.00	12@17	.015	17–20	27	5BT	Fly	1,6,2,5,8,3,7,4	5.0	2.25	BS	(c)	(c)	10	.028	.....	W-A	114	17	.....	.....	Pos	UH	34
35	Packard-Sup. 8 2003-23-4-5	AL	IGT-4203	23–3600	7.00	11@16	.015	17–20	27	4BT	VD	1,6,2,5,8,3,7,4	5.0	2.25	BS	(c)	(c)	10	.028	.....	AL	114	17	.....	.....	Pos	UH	35
36	Packard-Cus. Sup. 8 2006-7-8	AL	IGT-4203	23–3600	7.00	11@16	.015	17–20	27	4BT	VD	1,6,2,5,8,3,7,4	5.0	2.25	BS	(c)	(c)	10	.028	.....	AL	114	17	.....	.....	Pos	UH	36
37	Plymouth-DeL. & Spec. DL. P-14	AL	IGS-4203C-1	20–2300	5.00	15@15	.020	17–20	38	3BT	VD	1,5,3,6,2,4	5.0	2.25	YT	AL	A7	14	.025	.....	AL	95	15	.....	.....	Pos	LF	37
38	Pontiac-DeLuxe 6 42-2[illegible]	DR	647-D	28.5–4000	8.0	15@16	.021	17–21	35	4BT	Fly	1,5,3,6,2,4	4.5	2.50	DR	AC	45	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	38
39	Pontiac-Stream. 6 42-26	DR	647-D	28.5–4000	8.0	15@16	.021	17–21	35	4BT	Fly	1,5,3,6,2,4	4.5	2.50	DR	AC	45	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	39
40	Pontiac-DeLuxe 8 42-27	DR	1110904	28–4200	8.0	20@17	.015	19–23	31	4BT	Fly	1,6,2,5,8,3,7,4	4.5	2.50	DR	AC	45	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	40
41	Pontiac-Stream. 8 42-28	DR	1110804	28–4200	8.0	20@17	.015	19–23	31	4BT	Fly	1,6,2,5,8,3,7,4	4.5	2.50	DR	AC	45	14	.025	Pak	DR	100	15	7.0	.....	Neg	UH	41
42	Studebaker Champion 6. 4G	AL	IGC-4801	14–2800	4.00	18@15	.020	17–20	35	2BT	Fly	1,5,3,6,2,4	5.0	1.00	YT	CH	J-9	14	.015	AW	Wil	90	13	5.7	5.75	Pos	UH	42
43	Studebaker-Commander 6. 12A	AL	IGC-4802	20–2900	3.00	12@12	.020	17–20	35	2BT	VD	1,5,3,6,2,4	5.0	1.00	YT	CH	J-9	14	.025	AW	Wil	95	15	5.7	5.75	Pos	LF	43
44	Studebaker-President 8. 8C	AL	IGH-4101	27–3600	3.00	12@12	.020	17–20	34	TC	VD	1,6,2,5,8,3,7,4	5.0	1.00	YT	CH	J-9	14	.025	AW	Wil	95	15	5.7	5.75	Pos	LF	44
45	Willys-Americar 442	AL	IGW-4129	19–3000	3.50	20@15	.020	17–20	41	TC	Fly	1,3,4,2 [illegible]	5.0	2.50	Dg	CH	J-9	14	.030	.....	AL	80	13	7.0	5.0	Neg	RF	45

ABBREVIATIONS:
(a)—Delco-Remy 1110132; ALIGC-4505
(b)—½ inch before top center
(c)—AC-104 or Champion Y4A
AC—AC Spark Plug Div.
AL—The Electric Auto-Lite Co.
AT—After top center
AW—American Enamel Magnet Wire Co.
BS—Briggs & Stratton Corp.
BT—Before top center
CH—Champion Spark Plug Co.
D-B—Delco Remy and Briggs & Stratton
Dg—H. A. Douglas
DH—Distributor housing
DR—Delco-Remy Div.
Ex—Essex Wire Corp.
LF—Left fender shield, under hood
Mit—Mitchellock-United Specialties Co.
Nat—National Battery Co.
Neg—Negative
Pak—Packard Electric Company
Pos—Positive
RF—Right side, under hood
TC—Top center
TD—Timing disc
UF—Under front seat
UH—Under hood
VD—Vibration damper
W-A—Willard & Auto-Lite
Wil—Willard Storage Battery Co.
YT—Yale & Towne Mfg. Co.

Starting Motor—Valve Timing

Line Number	PASSENGER CAR MAKE AND MODEL	STARTING MOTOR: Make	Model	Cranking Speed	Brush Spring Tension (Oz.)	Lock Test: Amperage Draw	Lock Test: Volts	Lock Test: Torque (Lb. Ft.)	No Load Test: Amperage Draw	No Load Test: Volts	No Load Test: R.P.M.	Type of Drive	Starting Device	Starting Operation	Pinion Meshes	VALVE TAPPET CLEARANCE (Inches): Intake: Operating	Intake: Timing	Exhaust: Operating	Exhaust: Timing	Hydraulic Valve Lifters	VALVE TIMING (Degrees): Intake: Open	Intake: Closed	Exhaust: Open	Exhaust: Closed	Timing Marks Located	Line Number
1	Buick-Special 42-40A	DR	1107049	90	24-28	525	3.37	12.0	65	5.0	5000	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	13BT	68AB	55BB	22AT	FW	1
2	Buick-Ex. Spec. 42-40B	DR	1107049	90	24-28	525	3.37	12.0	65	5.0	5000	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	13BT	68AB	55BB	22AT	FW	2
3	Buick-Super 42-50	DR	1107049	90	24-28	525	3.37	12.0	65	5.0	5000	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	13BT	68AB	55BB	22AT	FW	3
4	Buick-Century 42-60	DR	1107929	90	24-28	600	3.00	16.0	65	5.0	5500	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	14BT	71AB	56BB	25AT	FW	4
5	Buick-Roadmaster 42-70	DR	1107929	90	24-28	600	3.00	16.0	65	5.0	5500	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	14BT	71AB	56BB	25AT	FW	5
6	Buick-Limited 42-90	DR	1107929	90	24-28	600	3.00	16.0	65	5.0	5500	OC	Sol	Dap	F	.015H	.....	.015H	.....	N	14BT	71AB	56BB	25AT	FW	6
7	Cadillac 61, 62, 63, 60S	DR	1107931	.....	24-28	600	3.00	16.0	65	5.0	5500	OC	Sol	Pbd	F	HA	HA	HA	HA	Y	TC	42AB	52BB	10AT	.....	7
8	Cadillac 67, 75	DR	1107931	.....	24-28	600	3.00	16.0	65	5.0	5500	OC	Sol	Pbd	F	HA	HA	HA	HA	Y	TC	42AB	52BB	10AT	.....	8
9	Chevrolet	DR	1107054	65	24-28	525	3.37	12.0	65	5.0	5000	OC	Man	Dsp	F	.006H	.006H	.013H	.013H	N	3BT	35AB	46BB	5AT	FW	9
10	Chrysler-Roy. & Win. C-34	AL	MAX-4050	.....	42-53	640	3.00	16.5	65	5.5	5300	OC	Sol	Pbd	F	.008H	.014	.010H	.014	N	12BT	44AB	50BB	6AT	VD	10
11	Chrysler-Sar. & N.Y. C-36	AL	MAX-4050	.....	42-53	640	3.00	16.5	65	5.5	5300	OC	Sol	Pbd	F	.008H	.011	.010H	.014	N	6BT	50AB	44BB	12AT	VD	11
12	Chrysler-Crown Imp. C-37	AL	MAX-4050	.....	42-53	640	3.00	16.5	65	5.5	5300	OC	Sol	Pbd	F	.008H	.011	.010H	.014	N	6BT	50AB	44BB	12AT	VD	12
13	Crosley '42	AL	MZ-4077	240	42-53	560	4.00	11.8	70	5.5	4300	Ben	Man	Dsp	R	.006C	.....	.008C	.....	N	20BT	60AB	60BB	20AT	FW	13
14	De Soto-DeL. & Cust. S-10	AL	MAW-4026	.....	42-53	505	3.00	11.5	65	5.5	4900	OC	Man	Dsp	F	.007H	.014	.009H	.014	N	12BT	44AB	50BB	6AT	VD	14
15	Dodge-DeL. & Cust. D-22	AL	MAW-4026	.....	42-53	505	3.00	11.5	65	5.5	4900	OC	Man	Dsp	F	.008H	.014	.010H	.014	N	12BT	44AB	50BB	6AT	VD	15
16	Ford-Six	Own	.....	100	32	500	3.50	14.0	.....	.....	.....	Ben	Sol	Pbd	.....	.013C	.015	.013C	.015	.....	3BT	41AB	48BB	6AT	DH	16
17	Ford-Eight	Own	.....	100	32	500	3.50	14.0	.....	.....	.....	Ben	Sol	Pbd	.....	.011C	.015	.015C	.015	.....	TC	44AB	48BB	6AT	DH	17
18	Hudson-Six & DeL. 20	AL	MZ-4092	150	42-53	420	3.00	7.8	70	5.5	4300	Ben	Sol	Pbd	R	.010H	.....	.012H	.....	N	27⅝BT	68½AB	51⅝BB	32½AT	FW	18
19	Hudson-Super. & Com. 6. 21, 22	AL	MZ-4092	150	42-53	420	3.00	7.8	70	5.5	4300	Ben	Sol	Pbd	R	.006H	.....	.008H	.....	N	10⅔BT	60AB	50BB	18¾AT	FW	19
20	Hudson-Com. 8 24, 25	AL	MAB-4100	150	42-53	582	3.00	15.8	60	5.5	3700	Ben	Sol	Pbd	R	.006H	.....	.008H	.....	N	10⅔BT	60AB	50BB	18¾AT	FW	20
21	Hudson-Com, Cust. 8 27	AL	MAB-4100	150	42-53	582	3.00	15.8	60	5.5	3700	Ben	Sol	Pbd	R	.006H	.....	.008H	.....	N	.....	.....	.....	.....	.....	21
22	Lincoln-Zeph. & Cont.	Own	.....	100	32	500	3.50	14.0	.....	.....	.....	Ben	Sol	Pbd	.....	HA	HA	HA	HA	Y	10⅔BT	36AB	51BB	8AT	DH	22
23	Lincoln-Custom	Own	.....	100	32	500	3.50	14.0	.....	.....	.....	Ben	Sol	Pbd	.....	HA	HA	HA	HA	Y	10⅔BT	36AB	51BB	8AT	DH	23
24	Mercury	Own	.....	100	32	500	3.50	14.0	.....	.....	.....	Ben	Sol	Pbd	.....	.011C	.015	.015C	.015	N	TC	44AB	48BB	6AT	DH	24
25	Nash-Ambassador 600 42-40	DR	1109451	.....	24-28	540	3.30	11.5	60	5.7	6000	Ben	Man	Dcp	.....	.015	.019	.015	.019	N	19BT	63AB	59BB	23AT	No	25
26	Nash-Ambassador 6 42-60	AL	MAB-4076	160	42-53	582	3.00	15.8	60	5.5	3700	Ben	Man	Dcp	R	.015	.019	.015	.019	N	14BT	60AB	75BB	31AT	No	26
27	Nash-Ambassador 8 42-80	AL	MAB-4104	160	42-53	582	3.00	15.8	60	5.5	3700	Ben	Man	Dcp	R	.015	.015	.015	.015	N	14BT	60AB	75BB	31AT	No	27
28	Oldsmobile-Special Six 66	DR	1107034	100	24-28	525	3.37	12.0	65	5.0	5000	OC	Man	Dsp	F	.008	.012	.011	.015	N	5BT	45AB	45BB	5AT	FW	28
29	Oldsmobile-Dynamic Six 76	DR	1107034	100	24-28	525	3.37	12.0	65	5.0	5000	OC	Man	Dsp	F	.008	.012	.011	.015	N	5BT	45AB	45BB	5AT	FW	29
30	Oldsmobile-Special 8 68	DR	1107922	100	24-28	600	3.00	15.0	60	5.0	6000	OC	Man	Dsp	F	.008	.012	.011	.015	N	TC	35AB	45BB	10AT	FW	30
31	Oldsmobile-Dynamic 8 78	DR	1107922	100	24-28	600	3.00	15.0	60	5.0	6000	OC	Man	Dsp	F	.008	.012	.011	.015	N	TC	35AB	45BB	10AT	FW	31
32	Oldsmobile-Custom 8 98	DR	1107930	100	24-28	600	3.00	15.0	60	5.0	6000	OC	Sol	Pbd	F	.008	.012	.011	.015	N	TC	35AB	45BB	10AT	FW	32
33	Packard-Six 2000-2020	(a)	(a)	.....	42-53	505	3.00	11.5	65	5.5	4900	Ben	Sol	Pbd	F	.007H	.012	.010H	.015	N	1BT	39AB	45BB	5AT	VD	33
34	Packard-Eight 2001-2021	AL	MAW-4027	.....	42-53	505	3.00	11.5	65	5.5	4900	Ben	Sol	Pbd	F	.007H	.012	.010H	.015	N	1BT	39AB	45BB	5AT	VD	34
35	Packard-Sup. 8 2003-23-4-5	AL	MAX-4052	.....	42-53	652	3.00	33.5	77	5.5	2700	OC	Sol	Pbd	F	HA	HA	HA	HA	Y	4BT	51AB	49BB	10AT	VD	35
36	Packard-Cus. Sup. 8 2006-7-8	AL	MAX-4052	.....	42-53	652	3.00	33.5	77	5.5	2700	OC	Sal	Pbd	F	HA	HA	HA	HA	Y	4BT	51AB	49BB	10AT	VD	36
37	Plymouth-DeL. & Spec. DL. P-14	AL	MZ-4105	.....	42-53	420	3.00	7.8	70	5.5	4300	OC	Man	Dsp	F	.008H	.014	.010H	.014	N	12BT	44AB	50BB	6AT	VD	37
38	Pontiac-DeLuxe 6 42-25	DR	1107032	.....	24-28	525	3.37	12.0	65	5.0	5000	OC	Man	Dsp	F	.012H	.015	.012H	.015	N	5BT	39AB	45BB	5AT	FW	38
39	Pontiac-Stream. 6 42-26	DR	1107032	.....	24-28	525	3.37	12.0	65	5.0	5000	OC	Man	Dsp	F	.012H	.015	.012H	.015	N	5BT	39AB	45BB	5AT	FW	39
40	Pontiac-DeLuxe 8 42-27	DR	1107921	.....	24-28	600	3.00	16.0	60	5.0	6000	OC	Man	Dsp	F	.012H	.015	.012H	.015	N	5BT	39AB	45BB	5AT	FW	40
41	Pontiac-Stream. 8 42-28	DR	1107921	.....	24-28	600	3.00	16.0	60	5.0	6000	OC	Man	Dsp	F	.012H	.015	.012H	.015	N	5BT	39AB	45BB	5AT	FW	41
42	Studebaker Champion 6. 4G	AL	MZ-4090	130	42-53	420	3.00	7.8	70	5.5	4300	Ben	Man	Dcp	R	.016C	.020	.016C	.020	N	15BT	49AB	54BB	10AT	FW	42
43	Studebaker-Commander 6. 12A	AL	MAW-4020	130	42-53	505	3.00	11.5	65	5.5	4900	Ben	Man	Dcp	F	.016C	.020	.016C	.020	N	15BT	49AB	54BB	10AT	VD	43
44	Studebaker-President 8. 8C	AL	MAX-4051	110	42-53	640	3.00	16.5	65	5.5	5300	OC	Sol	Dcp	F	.016C	.020	.016C	.020	N	15BT	49AB	54BB	10AT	VD	44
45	Willys-Americar 442	AL	MZ-4109	185	42-53	420	3.00	7.8	70	5.5	4300	Ben	Man	Pbd	F	.014C	.020	.014C	.020	N	9BT	50AB	47BB	12AT	FW	45

ABBREVIATIONS:

(a)—Auto-Lite MAW-4027 or Delco-Remy 1107056 on model 2000 and Delco-Remy 1107037 on model 2020
AB—After bottom center
AL—Electric Auto-Lite Co.
AT—After top center
BB—Before bottom center
Ben—Bendix, Eclipse Machine Div.
BT—Before top center
C—Cold
Dap—Depress accelerator pedal
Dcp—Depress clutch pedal
DH—Distributor housing
DR—Delco-Remy Div.
Dsp—Depress starter pedal
FW—Fly wheel
HA—Hydraulic automatic adjustment
Man—Manual
N—No
F—Front
H—Hot
OC—Overrunning clutch
Pbd—Push button on dash board
R—Rear
Sol—Solenoid
TC—Top center
VD—Crankshaft vibration damper
Y—Yes

Generators and Clutches

Line Number	PASSENGER CAR MAKE AND MODEL	Make	Model	Type	Brush Spring Tension (oz.)	Charging Control	MAXIMUM CONTROLLED CHARGING RATE: Temperature (°F)	Amperes	Voltage	R.P.M.	CUTOUT RELAY: Voltage at Closing	Amperes to Open—Reverse Current	Average Air Gap (In.)	VOLTAGE REGULATOR: Volts	Temperature (°F)	Average Air Gap (In.)	CURRENT REGULATOR: Amperes	Temperature (°F)	Average Air Gap (In.)	Car Speed for Maximum Charging Rate—M.P.H.	Ammeter—Make	CLUTCH: Make	Drive Type	Vibration Insulator	FACINGS: Material	Inside Diam. (In.)	Outside Diam. (In.)	Thickness (In.)	No. Required	Line Number
1	Buick-Special 42-40A	DR	1102679	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	25	AC	Own*	Dff	Spr	Wo	6	10	1/8	2	1
2	Buick-Ex. Spec. 42-40B	DR	1102679	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	Own*	Dff	Spr	Wo	6	10	1/8	2	2
3	Buick-Super 42-50	DR	1102679	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	Own*	Dff	Spr	Wo	6	10	1/8	2	3
4	Buick-Century 42-60	DR	1102668	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	26	AC	Own*	Dff	Spr	Wo	6 1/2	10 1/2	1/8	2	4
5	Buick-Roadmaster 42-70	DR	1102668	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	25	AC	Own*	Dff	Spr	Wo	6 1/2	10 1/2	1/8	2	5
6	Buick-Limited 42-90	DR	1102668	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	Own*	Dff	Spr	Wo	6 1/2	10 1/2	1/8	2	6
7	Cadillac 61, 62, 63, 60S	DR	1102693	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.....	7.2-7.4	Opr	.072	32-34	Opr	.....	27	AC	Long•	Dff†	Spr	Wo	7	10 1/2	.137	2	7
8	Cadillac 67, 75	DR	1102693	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.....	7.2-7.4	Opr	.072	32-34	Opr	.....	27	AC	Long•	Dff†	Spr	Wo	7	11	.137	2	8
9	Chevrolet	DR	1102667	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-4	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	25	AC	Inl	Dff	Spr	Wo	6 1/8	9 1/8	.135	2	9
10	Chrysler-Roy. & Win. C-34	AL	GDZ-4801A	Shu	Max. 53	CV	H-C	35	8.0	2300	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	25	.....	.....	Dff†	Spr	MW	7	10	1/8	2	10
11	Chrysler-Sar. & N.Y. C-36	AL	GDZ-4801A	Shu	Max. 53	CV	H-C	35	8.0	2300	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	25	.....	B&B	FD	FC	MW	6	10	1/8	2	11
12	Chrysler-Crown Imp. C-37	AL	GEG-4818C	Shu	64-68	CV	H-C	40	8.0	1800	6.4-6.6	4-6	.032	7.2-7.5	70	.050	39-41	H-C	.050	23	.....	B&B	FD	FC	MW	6	10	1/8	2	12
13	Crosley '42	AL	GBM-4619-5	3BR	Max. 53	No	Hot	12	8.0	2400	6.5-7.2	.5-2.5	.030	No	No	No	No	No	No	28	AC	Rock	Dff	Mo	Mo	4	6	1/8	2	13
14	De Soto-DeL. & Cust. S-10	AL	GDZ-4801A	Shu	Max. 53	CV	H-C	35	8.0	2300	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	25	.....	B&B	Dff†	Spr	Wo	7	10	1/8	2	14
15	Dodge-DeL. & Cust. D-22	AL	GDZ-4801B	Shu	Max. 53	CV	H-C	35	8.0	2300	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	25	.....	B&B	Dff†	Spr	Wo	7	10	1/8	2	15
16	Ford-Six	Own	.....	Shu	.....	CV	.....	32	6.0	3000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Own	.....	Dff	Spr	Wo	.....	10	1/8	2	16
17	Ford-Eight	Own	01A-10000B	Shu	28	CV	.....	32	6.0	3000	6.0-6.3	Max. 8	.....	6.8-7.2	70	.048	30-33	70	.048	.....	Own	Long	Dff	Spr	Mo	5 3/4	9	1/8	2	17
18	Hudson-Six & DeL. 20	AL	GDS-4801A	3BR	Max. 53	V	70	34	8.0	3200	6.4-6.6	4-6	.032	7.2-7.5	70	.050	No	No	No	35	IL	Own	Dff	Spr	Co	5 1/4	8 11/16	.....	90	18
19	Hudson-Super. & Com. 6 21, 22	AL	GEC-4801A	3BR	Max. 53	V	70	43	8.0	3200	6.4-6.6	4-6	.032	7.2-7.5	70	.050	No	No	No	35	IL	Own	Dff	Spr	Co	5 1/4	8 11/16	.....	90	19
20	Hudson-Com. 8 24, 25	AL	GEC-4801A	3BR	Max. 53	V	70	43	8.0	3200	6.4-6.6	4-6	.032	7.2-7.5	70	.050	No	No	No	35	IL	Own	Dff	Spr	Co	6 3/8	9 1/16	.....	108	20
21	Hudson-Com. Cust. 8 27	AL	GEC-4801A	3BR	Max. 53	V	70	43	8.0	3200	6.4-6.6	4-6	.032	7.2-7.5	70	.050	No	No	No	35	IL	Own	Dff	Spr	Co	6 3/8	9 1/16	.....	108	21
22	Lincoln-Zeph. & Cont.	Own	01A-10000B	Shu	28	CV	.....	32	6.0	3000	6.0-6.3	Max. 8	.....	6.8-7.2	70	.048	30-33	70	.048	.....	Own	Long	Dff†	Spr	Wo	6 3/4	10	1/8	2	22
23	Lincoln-Custom	Own	01A-10000B	Shu	28	CV	.....	32	6.0	3000	6.0-6.3	Max. 8	.....	6.8-7.2	70	.048	30-33	70	.048	.....	Own	Long	Dff†	Spr	Wo	6 3/4	10	1/8	2	23
24	Mercury	Own	01A-10000B	Shu	28	CV	.....	32	6.0	3000	6.0-6.3	Max. 8	.....	6.8-7.2	70	.048	30-33	70	.048	.....	Own	Long	Dff†	Spr	Wo	6 3/4	10	1/8	2	24
25	Nash-Ambassador 600 42-40	DR	1102684	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	.....	KS	B&B	Dff	Spr	Mo	5 3/8	8	1/8	2	25
26	Nash-Ambassador 6 42-60	AL	GDZ-4806A	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	KS	B&B	Dff	Spr	Wo	7	10	1/8	2	26
27	Nash-Ambassador 8 42-80	AL	GDZ-4803B	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	AL	B&B	Dff	Spr	Wo	7	10	1/8	2	27
28	Oldsmobile-Special Six 66	DR	1102664	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	B&B•	Dff†	Spr	MW	6	9 1/4	1/8	2	28
29	Oldsmobile-Dynamic Six 76	DR	1102664	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	B&B•	Dff†	Spr	MW	6	9 1/4	1/8	2	29
30	Oldsmobile-Special 8 68	DR	1102664	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	B&B•	Dff†	Spr	MW	7	10	1/8	2	30
31	Oldsmobile-Dynamic 8 78	DR	1102664	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	B&B•	Dff†	Spr	MW	7	10	1/8	2	31
32	Oldsmobile-Custom 8 98	DR	1102664	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.072	32-34	Opr	.082	24	AC	B&B•	Dff†	Spr	MW	7	10	1/8	2	32
33	Packard-Six 2000-2020	AL(a)	GDZ-4801F	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	.....	Long	Dff	Spr	Wo	6	9 1/2	1/8	2	33
34	Packard-Eight 2001-2021	AL	GDZ-4801F	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	.....	Long	Dff	Spr	Wo	6	10	1/8	2	34
35	Packard-Sup. 8 2003-23-4-5	AL	GEA-4802A-1	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	.....	Long	Dff	Spr	Wo	6 1/2	11	1/8	2	35
36	Packard-Cus. Sup. 8 2006-7-8	AL	GEA-4802A-1	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	.....	.....	Long	Dff	Spr	Wo	6 1/2	11	1/8	2	36
37	Plymouth-DeL. & Spec. DL. P-14	AL	GDZ-4801B	Shu	Max. 53	CV	H-C	35	8.0	2300	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	25	.....	B&B	Dff	Spr	MW	6	9 1/4	1/8	2	37
38	Pontiac-DeLuxe 6 42-25	DR	1102665	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.070	32-34	Opr	.082	35	AC	Inl-L	Dff	Spr	Mo	6	9 1/8	1/8	2	38
39	Pontiac-Stream. 6 42-26	DR	1102665	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.070	32-34	Opr	.082	35	AC	Inl-L	Dff	Spr	Mo	6	9 1/8	1/8	2	39
40	Pontiac-DeLuxe 8 42-27	DR	1102665	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.070	32-34	Opr	.082	35	AC	Inl-L	Dff	Spr	Mo	6	9 1/8	1/8	2	40
41	Pontiac-Stream. 8 42-28	DR	1102665	Shu	24-28	CV	Opr	34	8.0	2400	6.2-6.7	0-2	.020	7.2-7.4	Opr	.070	32-34	Opr	.082	35	AC	Inl-L	Dff	Spr	Mo	6	9 1/8	1/8	2	41
42	Studebaker Champion 6 4G	AL	GDZ-4804A	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	18	SW	B&B	Dff	Spr	Mo	5	8	1/8	2	42
43	Studebaker-Commander 6 12A	AL	GDZ-4805A	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	20	SW	B&B	Dff†	Spr	Mo	6	9 1/4	1/8	2	43
44	Studebaker-President 8 8C	AL	GDZ-4805A	Shu	Max. 53	CV	H-C	35	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	34-36	H-C	.050	20	SW	Inl-L	Dff†	Spr	Mo	6	9 1/4	1/8	2	44
45	Willys-Americar 442	AL	GCJ-4611-A	3BR	Max. 53	V	70	25	8.0	.....	6.4-6.6	4-6	.032	7.2-7.5	70	.050	No	No	No	.....	KS	Atw	Dff	Spr	Mo	5 1/8	7 1/8	1/8	2	45

ABBREVIATIONS:

†—Through fluid flywheel with automatic transmissions at extra cost
•—With Hydra-Matic Drive there is no clutch
*—Long or Borg & Beck Disc
(a)—Or Delco-Remy 1102682
3BR—Third Brush type

AC—AC Spark Plug Co.
AL—The Electric Auto-Lite Co.
Atw—Atwood
B&B—Borg & Beck Division
Co—Cork
CV—Current and voltage regulator
Dff—Direct to flywheel face
DR—Delco-Remy Division
FC—Fluid coupling
FD—Fluid drive
H-C—Hot or cold
IL—Indicating light
Inl—Inland Manufacturing Division
Inl-L—Inland with Long disc
KS—King-Seeley Corp.
Long—Long Manufacturing Division
Max—Maximum
Mo—Molded asbestos
MW—Molded on one face, woven on other face
No—No or None
Opr—Operating temperature
Rock—Rockford Drilling Machine Div.
Shu—Shunt **Spr**—Springs
SW—Stewart-Warner Corp.
V—Voltage regulator
Wo—Woven asbestos

Transmissions and Universal Joints

Line Number	PASSENGER CAR MAKE AND MODEL	Make	SHIFTING: Meshing of Gears	SHIFTING: Selection of Gears	AUTOMATIC SHIFT: Make	AUTOMATIC SHIFT: Type	OVERDRIVE: Make	OVERDRIVE: Lubrication: Capacity (Pts.)	OVERDRIVE: Lubrication: Grade: Summer	OVERDRIVE: Lubrication: Grade: Winter	GEAR RATIOS—STD.: Rear Axle	GEAR RATIOS—STD.: Transmission: Overdrive	GEAR RATIOS—STD.: Transmission: Low	GEAR RATIOS—STD.: Transmission: Second	GEAR RATIOS—STD.: Transmission: Reverse	Constant Mesh Gears on Second	TYPE GEARS: Second Speed	TYPE GEARS: First Speed	TYPE GEARS: Reverse	Synchronous Meshing Second and Third Gears	LUBRICATION: Capacity (Pts.)	LUBRICATION: Grade: Summer	LUBRICATION: Grade: Winter	UNIVERSAL JOINTS: Make	UNIVERSAL JOINTS: Number Used	UNIVERSAL JOINTS: Type	UNIVERSAL JOINTS: Lubricated With	Drive Medium	Torque Medium	Line Number
1	Buick-Special 42-40A	Own	RL	RL	No	No	No	No	No	No	4.10	No	2.67-	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	S-S	1	Mp	TL	TT	TT	1
2	Buick-Ex. Spec. 42-40B	Own	RL	RL	No	No	No	No	No	No	4.40	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	S-S	1	Mp	TL	TT	TT	2
3	Buick-Super 42-50	Own	RL	RL	No	No	No	No	No	No	4.40	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	S-S	1	Mp	TL	TT	TT	3
4	Buick-Century 42-60	Own	RL	RL	No	No	No	No	No	No	3.90	No	2.39	1.53	2.53	Y	HI	HI	HI	Y	2½	90EP	90EP	Sag	1	Mp	TL	TT	TT	4
5	Buick-Roadmaster 42-70	Own	RL	RL	No	No	No	No	No	No	4.10	No	2.39	1.53	2.53	Y	HI	HI	HI	Y	2½	90EP	90EP	Sag	1	Mp	TL	TT	TT	5
6	Buick-Limited 42-90	Own	RL	RL	No	No	No	No	No	No	4.55	No	2.39	1.53	2.53	Y	HI	HI	HI	Y	2½	90EP	90EP	Sag	1	Mp	TL	TT	TT	6
7	Cadillac 61, 62, 63, 60S	Own	RL	RL	Own*	●	No	No	No	No	3.77	No	2.39	1.53	2.39	Y	HI	HI	HI	Y	4	90EP	90EP	Mec	2	Nb	PL	RS	RS	7
8	Cadillac 67, 75	Own	RL	RL	Own*	●	No	No	No	No	4.27	No	2.39	1.53	2.39	Y	HI	HI	HI	Y	4	90EP	90EP	Mec	2	Nb	PL	RS	RS	8
9	Chevrolet	Own	RV	RL	No	No	No	No	No	No	4.11	No	2.94	1.68	2.94	Y	HI	HI	HI	Y	1½	90	90	Own	1	Mta	TL	RS	TT	9
10	Chrysler-Roy. & Win. C-34	Own	RL	RL	Own*	**	No	No	No	No	3.90	No	2.57	1.83	3.48	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	2	CT	FG	RS	RS	10
11	Chrysler-Sar. & N.Y. C-36	Own	RL	RL	Own*	**	No	No	No	No	3.90	No	2.57	1.83	3.48	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	2	CT	FG	RS	RS	11
12	Chrysler-Crown Imp. C-37	Own	RV	RL	Own	Vac	No	No	No	No	3.58	No	3.07	1.98	3.25	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	3	CT	FG	RS	RS	12
13	Crosley *42	WG	.....	.....	No	No	No	No	No	No	5.14	No	3.29	1.72	3.29	Y	Sp	Sp	Sp	N	1	90	90	Spi	1	Mp	Gr	TT	TT	13
14	De Soto-DeL. & Cust. S-10	Own	RL	RL	Own*	‡	No	No	No	No	3.90	No	2.57	1.83	3.48	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	2	CT	.....	RS	RS	14
15	Dodge-DeL. & Cust. D-22	Own	RL	RL	No	No	No	No	No	No	4.11	No	2.57	1.83	3.48	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	2	BT	.....	RS	RS	15
16	Ford-Six	Own	RL	RL	No	No	No	No	No	No	3.78	No	3.11	1.77	4.00	Y	HI	HI	HI	Y	2¾	.....	.....	Spi	1	Sb	Ssb	TT	TT	16
17	Ford-Eight	Own	RL	RL	No	No	No	No	No	No	3.78	No	3.11	1.77	4.00	Y	HI	HI	HI	Y	2¾	.....	.....	Spi	1	Sb	Ssb	TT	TT	17
18	Hudson-Six & DeL. 20	Own	RL	Cab	Own*	●●	WG*	1¼*	90EP*	90EP*	4.55	.72*	2.88	1.82	3.50	Y	HI	HI	HI	Y	2	90EP	80EP	Spi	2	Nb	Ssb	RS	RS	18
19	Hudson-Super. & Com. 6 21, 22	Own	RL	Cab	Own*	●●	WG*	1¼*	90EP*	90EP*	4.11	.72*	2.88	1.82	3.50	Y	HI	HI	HI	Y	2	90EP	80EP	Spi	2	Nb	Ssb	RS	RS	19
20	Hudson-Com. 8 24, 25	Own	RL	Cab	Own*	●●	WG*	1¼*	90EP*	90EP*	4.11	.72*	2.88	1.82	3.50	Y	HI	HI	HI	Y	2	90EP	80EP	Spi	2	Nb	Ssb	RS	RS	20
21	Hudson-Com. Cust. 8 27	Own	RL	Cab	Own*	●●	WG*	1¼*	90EP*	90EP*	4.11	.72*	2.88	1.82	3.50	Y	HI	HI	HI	Y	2	90EP	80EP	Spi	2	Nb	Ssb	RS	RS	21
22	Lincoln-Zeph. & Cont.	Own	RL	RL	Own*	††	Own*	*	*	*	4.22	*	2.33	1.57	3.00	Y	HI	HI	HI	Y	2¾	.....	.....	Spi	1	Nb	Ssb	TT	TT	22
23	Lincoln-Custom	Own	RL	RL	Own*	††	Own*	*	*	*	4.22	*	2.33	1.57	3.00	Y	HI	HI	HI	Y	2¾	.....	.....	Spi	1	Nb	Ssb	TT	TT	23
24	Mercury	Own	RL	RL	Own*	††	No	No	No	No	3.54	No	3.11	1.77	4.00	Y	HI	HI	HI	Y	2¾	.....	.....	Spi	1	Sb	Ssb	TT	TT	24
25	Nash-Ambassador 600 42-40	WG	RL	RL	No	No	WG*	2*	70*	50*	4.11	.72*	2.66	1.56	3.55	Y	HI	HI	HI	Y	1	70	50	Mec	1	Mta	PL	TT	TT	25
26	Nash-Ambassador 6 42-60	Own	RL	RL	No	No	WG*	2*	70*	50*	4.11	.72*	2.57	1.55	3.48	Y	HI	HI	HI	Y	4	70	50	Mec	2	Mta	PL	RS	RS	26
27	Nash-Ambassador 8 42-80	Own	RL	RL	No	No	WG*	2*	70*	50*	4.11	.72*	2.57	1.55	3.48	Y	HI	HI	HI	Y	4	70	50	Mec	2	Mta	PL	RS	RS	27
28	Oldsmobile-Special Six 66	Own	RL	RL	Own*	●	No	No	No	No	4.10	No	2.66	1.66	3.00	Y	HI	HI	HI	Y	2	90	90	Mec	2	Mta	PL	SA	SA	28
29	Oldsmobile-Dynamic Six 76	Own	RL	RL	Own*	●	No	No	No	No	4.30	No	2.66	1.66	3.00	Y	HI	HI	HI	Y	2	90	90	Mec	2	Mta	PL	SA	SA	29
30	Oldsmobile-Special 8 68	Own	RL	RL	Own*	●	No	No	No	No	3.90	No	2.66	1.66	3.02	Y	HI	HI	HI	Y	2	90	90	Mec	2	Mta	PL	SA	SA	30
31	Oldsmobile-Dynamic 8 78	Own	RL	RL	Own*	●	No	No	No	No	4.30	No	2.66	1.66	3.02	Y	HI	HI	HI	Y	2	90	90	Mec	2	Mta	PL	SA	SA	31
32	Oldsmobile-Custom 8 98	Own	RL	RL	Own*	●	No	No	No	No	4.30	No	2.66	1.66	3.02	Y	HI	HI	HI	Y	2	90	90	Mec	2	Mta	PL	SA	SA	32
33	Packard-Six 2000-2020	Own	RL	RL	Own*	§§§§§§§§	WG*	1¼*	140*	90*	4.30	.72*	2.43	1.53	3.16	Y	HI	HI	HI	Y	2	140	90	Mec	2	Mta	RG	RS	RS	33
34	Packard-Eight 2001-2021	Own	RL	RL	Own*		WG*	1¼*	140*	90*	(a)	.72*	2.43	1.53	3.16	Y	HI	HI	HI	Y	2	140	90	Mec	2	Mta	RG	RS	RS	34
35	Packard-Sup. 8 2003-23-4-5	Own	RL	RL	Own*		WG*	1¼*	140*	90*	(b)	.72*	2.43	1.53	3.16	Y	HI	HI	HI	Y	2	140	90	Mec	2	Mta	RG	RS	RS	35
36	Packard-Cus. Sup. 8 2006-7-8	Own	RL	RL	Own*		WG*	1¼*	140*	90*	(b)	.72*	2.43	1.53	3.16	Y	HI	HI	HI	Y	2	140	90	Mec	2	Mta	RG	RS	RS	36
37	Plymouth-DeL. & Spec. DL. P-14	Own	RL	RL	No	No	No	No	No	No	3.90	No	2.57	1.83	3.48	Y	HI	HI	HI	Y	2¾	90EP	90EP	.....	2	BT	.....	RS	RS	37
38	Pontiac-DeLuxe 6 42-25	Own	RL	RL	No	No	No	No	No	No	4.10	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	M-S	2	Mta	.....	RS	RS	38
39	Pontiac-Stream. 6 42-26	Own	RL	RL	No	No	No	No	No	No	4.30	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	M-S	2	Mta	.....	RS	RS	39
40	Pontiac-DeLuxe 8 42-27	Own	RL	RL	No	No	No	No	No	No	4.10	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	M-S	2	Mta	.....	RS	RS	40
41	Pontiac-Stream. 8 42-28	Own	RL	RL	No	No	No	No	No	No	4.30	No	2.67	1.66	3.02	Y	HI	HI	HI	Y	1¾	90EP	90EP	M-S	2	Mta	.....	RS	RS	41
42	Studebaker-Champion 6 4G	WG	RL	RL	No	No	WG*	2.2*	90*	90*	4.10	.72*	2.66	1.56	3.55	Y	HI	HI	HI	Y	1	90	90	Spi	2	Mta	PL	RS	RS	42
43	Studebaker-Commander 6 12A	WG	RL	RL	Own*	■	WG	2.2	90	90	4.09	.72	2.57	1.55	3.48	Y	HI	HI	HI	Y	2½	90	90	Spi	2	Mta	PL	RS	RS	43
44	Studebaker-President 8 8C	WG	RL	RL	Own*	■	WG	2	90	90	4.09	.72	2.57	1.55	3.48	Y	HI	HI	HI	Y	2½	90	90	Spi	2	Mta	PL	RS	RS	44
45	Willys-Americar 442	WG	RL	RL	No	No	WG*	1½*	90	80	4.44	.72*	2.66	1.56	3.55	Y	HI	HI	HI	Y	1	90	80	UP	2	Mta	.....	RS	RS	45

ABBREVIATIONS:

*—At extra cost
**—Vaca-Matic (Underdrive) with fluid fly wheel and vacuum shift
●—Hydra-Matic Drive—full automatic, hydraulically operated
●●—Drive-Master with vacuum and electric shift
■—Turbo-Matic Drive—fluid fly wheel and vacuum electric shift
‡—Simpli-Matic (Underdrive)—fluid fly wheel and vacuum shift
††—Liquamatic Drive—vacuum electric shift
§—Electromatic Drive—vacuum electric shift
(a)—4.1 on 2001; 4.09 on 2021
(b)—3.92 on 2003-6-23; 4.09 on 2004-7; 4.36 on 2005-8

BT—Ball and Trunnion type
Cab—Cable
CT—Cross type with roller bearings
EP—Extreme pressure
FG—Fibre grease
Gr—Grease
HI—Helical
Mec—Mechanics Universal Joint Division
Mp—Metal with plain bearings
M-S—Mechanics and Saginaw
Mta—Metal with anti-friction bearings
Nb—Needle bearing
No—No or None
PL—Permanent lubrication
RG—Repack with gun grease
RL—Rod Linkage
RS—Rear springs
RV—Rod and Vacuum
SA—Stabilizing arms
Sag—Saginaw Steering Gear Div.
Sb—Steel bushing
Sp—Spur gear
Spi—Spicer Manufacturing Co.
S-S—Saginaw or Spicer
Ssb—Soda soap grease
TL—Transmission Lubricant
TT—Torque Tube
UP—Universal Products
Vac—Vacuum
WG—Warner Gear Div.
Y—Yes

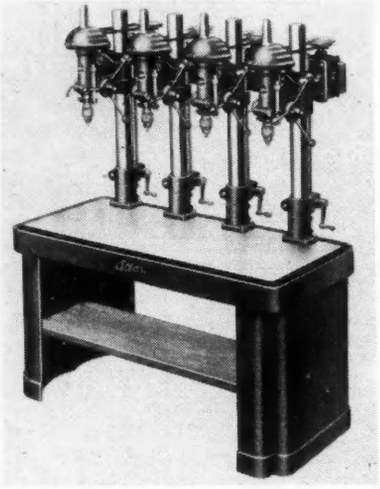
Steering and Brakes

Line Number	PASSENGER CAR MAKE AND MODEL	STEERING: Gear: Type	Gear: Make	Gear: Ratio (to 1)	Drag Link	No of Tie Rods	Intermediate Arm	Car Turning Radius—Right (Ft.)	Caster (Deg.)	Camber (Deg.)	Toe-in (In.)	Kingpin Inclination (Deg.)	FOOT BRAKE: Make	Type	Type Lining: Primary Shoe	Type Lining: Secondary Shoe	Drums: Material	Drums: Diameter	Lining: Length per Wheel (In.)	Lining: Width (In.)	Lining: Thickness (In.)	Clearance: Toe	Clearance: Heel	Total Foot Braking Area (Sq. In.)	Per Cent Braking on Rear Wheels	HAND BRAKE: Operates on	Internal or External	Drum Diameter	Lining: Length per Drum (In.)	Lining: Width (In.)	Lining: Thickness (In.)	Lining: Clearance (In.)	Line Number
1	Buick-Special 42-40A	BW	Sag	19.8	No	2	N	19.0	$\frac{3}{8}\pm\frac{3}{8}$	N$1\frac{1}{8}$ to +$1\frac{1}{8}$	0 to $\frac{1}{16}$	$3\frac{1}{2}$ to $4\frac{1}{4}$	B-D	H	Wo	Mo	Cl	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	.015	158.7	47.0	RS	Int	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	1
2	Buick-Ex. Spec. 42-40B	BW	Sag	19.8	No	2	N	19.8	$\frac{3}{8}\pm\frac{3}{8}$	N$1\frac{1}{8}$ to +$1\frac{1}{8}$	0 to $\frac{1}{16}$	$3\frac{1}{2}$ to $4\frac{3}{4}$	B-D	H	Wo	Mo	Cl	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	.015	158.7	47.0	RS	Int	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	2
3	Buick-Super 42-50	BW	Sag	19.8	No	2	N	19.8	$\frac{3}{8}\pm\frac{3}{8}$	N$1\frac{1}{8}$ to +$1\frac{1}{8}$	0 to $\frac{1}{16}$	$3\frac{1}{2}$ to $4\frac{3}{4}$	B-D	H	Wo	Mo	Cl	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	.015	158.7	47.0	RS	Int	12	$22\frac{11}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	.015	3
4	Buick-Century 42-60	BW	Sag	19.8	No	2	N	20.7	$\frac{3}{8}\pm\frac{3}{8}$	N$1\frac{1}{8}$ to +$1\frac{1}{8}$	0 to $\frac{1}{16}$	$3\frac{1}{2}$ to $4\frac{3}{4}$	B-D	H	Wo	Mo	Cl	12	$22\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.015	.015	206.4	47.0	RS	Int	12	$22\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.015	4
5	Buick-Roadmaster 42-70	BW	Sag	19.8	No	2	N	21.1	$\frac{3}{8}\pm\frac{3}{8}$	N$1\frac{1}{8}$ to +$1\frac{1}{8}$	0 to $\frac{1}{16}$	$3\frac{1}{2}$ to $4\frac{3}{4}$	B-D	H	Wo	Mo	Cl	12	$22\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.015	.015	206.4	47.0	RS	Int	12	$22\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.015	5
6	Buick-Limited 42-90	BW	Sag	23.6	No	2	N	22.7	$\frac{3}{8}\pm\frac{3}{8}$	N$3\frac{1}{8}$ to +$\frac{7}{8}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$	B-D	H	Wo	Mo	Cl	14	26	2	$\frac{1}{4}$	.015	.015	214.6	47.0	RS	Int	14	$23\frac{1}{16}$	2	$\frac{1}{4}$	.015	6
7	Cadillac 61, 62, 63, 60S	BW	Sag	19.8	Cr	2	N	(a)	N$1\frac{3}{4}$ to N$2\frac{3}{4}$	N$\frac{3}{8}$ to +$\frac{3}{8}$	$\frac{1}{32}$ to $\frac{3}{32}$	5° 51′	Ben	H	Mo	Mo	Com	12	$24\frac{1}{2}$	(c)	$\frac{3}{16}$	.010	.010	208.0	44.2	RS	Int	12	$24\frac{1}{2}$	(c)	$\frac{3}{16}$	.010	7
8	Cadillac 67, 75	BW	Sag	23.6	Cr	2	N	(b)	N$1\frac{3}{4}$ to N$2\frac{3}{4}$	N$\frac{3}{8}$ to +$\frac{3}{8}$	$\frac{1}{32}$ to $\frac{3}{32}$	5° 51′	Ben	H	Mo	Mo	Com	12	$24\frac{1}{2}$	(d)	$\frac{3}{16}$	.010	.010	233.0	44.2	RS	Int	12	$24\frac{1}{2}$	(d)	$\frac{3}{16}$	.010	8
9	Chevrolet	WR	Sag	17.5	No	2	N	20.0	0±$\frac{1}{2}$	N$1\frac{1}{4}\pm\frac{1}{2}$	0 to $\frac{1}{16}$	$3\frac{1}{4}\pm1\frac{1}{2}$	Own	H	Mo	Mo	(e)	11	$22\frac{5}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	(f)	(f)	152.2	47.5	RS	Int	11	$22\frac{5}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	(f)	9
10	Chrysler-Roy. & Win. C-34	WR	Gem	18.2	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cen	11	$19\frac{7}{16}$	2	$\frac{3}{32}$	.012	.006	155.5	40.0	PS	Ext	6	$16\frac{11}{16}$	2	$\frac{3}{32}$	.017	10
11	Chrysler-Sar. & N.Y. C-36	WR	Gem	20.4	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cen	12	(g)	2	$\frac{3}{32}$	(h)	(h)	189.2	39.0	PS	Ext	7	20	$2\frac{1}{2}$	$\frac{3}{32}$	.017	11
12	Chrysler-Crown Imp. C-37	WR	Gem	20.4	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cen	12	(g)	2	$\frac{3}{32}$	(h)	(h)	189.2	39.0	PS	Ext	7	20	$2\frac{1}{2}$	$\frac{3}{32}$	.017	12
13	Crosley '42	CL	Ross	17.0	Lg	1	N	34.0	$6\frac{1}{2}$ to 11	2	$\frac{1}{16}$ to $\frac{3}{64}$	$6\frac{1}{2}$	Haw	M	Wo	Wo	St	6	$18\frac{1}{4}$	1	$\frac{3}{32}$	(i)	(i)	150.4	50.0	RS	Int	6	$18\frac{1}{4}$	1	$\frac{3}{32}$	(i)	13
14	De Soto-DeL. & Cust. S-10	WR	Gem	18.2	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cl	11	$19\frac{7}{16}$	2	$\frac{3}{32}$	.012	.006	155.5	40.0	PS	Ext	6	$16\frac{11}{16}$	2	$\frac{3}{32}$	.017	14
15	Dodge-DeL. & Cust. D-22	WR	Gem	18.2	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cl	11	$19\frac{7}{16}$	2	$\frac{3}{32}$	.012	.006	155.5	40.0	PS	Ext	6	$15\frac{3}{4}$	2	$\frac{3}{32}$	.017	15
16	Ford-Six	WR	Gem	18.2	Tra	1	N	21.0	8	1	$\frac{1}{8}$	8	Own	H	Mo	Mo	CS	12	23.4	1.74	.020	.....	.....	163.0	40.0	RS	Int	12	23.4	1.74	.02	.....	16
17	Ford-Eight	WR	Gem	18.2	Tra	1	N	21.0	8	1	$\frac{1}{8}$	8	Own	H	Mo	Mo	CS	12	23.4	1.74	.020	.....	.....	163.0	40.0	RS	Int	12	23.4	1.74	.02	.....	17
18	Hudson-Six & DeL. 20	WR	Gem	18.2	Lg	2	Y	20.8	0±$\frac{1}{4}$	$\frac{1}{2}\pm\frac{1}{4}$	$\frac{1}{32}\pm\frac{1}{32}$	3° 36′	Ben	D	Mo	Wo	St	10	19.8	$1\frac{3}{4}$	$\frac{3}{16}$	.010	.010	138.9	50.0	RS	Int	10	19.8	$1\frac{3}{4}$	$\frac{3}{16}$	.010	18
19	Hudson-Super. & Com. 6 21, 22	WR	Gem	18.2	Lg	2	Y	21.3	0±$\frac{1}{4}$	$\frac{1}{2}\pm\frac{1}{4}$	$\frac{1}{32}\pm\frac{1}{32}$	3° 36′	Ben	D	Mo	Wo	St	10	19.8	$1\frac{3}{4}$	$\frac{3}{16}$	.010	.010	138.9	50.0	RS	Int	10	19.8	$1\frac{3}{4}$	$\frac{3}{16}$	.010	19
20	Hudson-Com. 8 24, 25	WR	Gem	18.4	Lg	2	Y	21.3	0±$\frac{1}{4}$	$\frac{1}{2}\pm\frac{1}{4}$	$\frac{1}{32}\pm\frac{1}{32}$	3° 36′	Ben	D	Mo	Wo	St	11	21.6	$1\frac{3}{4}$	$\frac{3}{32}$	.010	.010	141.1	50.0	RS	Int	11	21.6	$1\frac{3}{4}$	$\frac{3}{32}$	.010	20
21	Hudson-Com. Cust. 8 27	WR	Gem	18.4	Lg	2	Y	22.0	0±$\frac{1}{4}$	$\frac{1}{2}\pm\frac{1}{4}$	$\frac{1}{32}\pm\frac{1}{32}$	3° 36′	Ben	D	Mo	Wo	St	11	21.6	$1\frac{3}{4}$	$\frac{3}{32}$	.010	.010	141.1	50.0	RS	Int	11	21.6	$1\frac{3}{4}$	$\frac{3}{32}$	.010	21
22	Lincoln-Zeph. & Cont.	WR	Gem	18.4	Tra	1	N	21.0	3 to 5	$\frac{1}{4}$ to $\frac{3}{4}$	$\frac{1}{8}$	$3\frac{3}{4}$ to $4\frac{3}{4}$	Own	H	Mo	Wo	CS	12	23.9	1.74	.021	.....	.....	168.0	.....	RS	Int	12	23.9	1.74	.021	.....	22
23	Lincoln-Custom	WR	Gem	18.4	Tra	1	N	21.0	3 to 5	$\frac{1}{4}$ to $\frac{3}{4}$	$\frac{1}{8}$	$3\frac{3}{4}$ to $4\frac{3}{4}$	Own	H	Mo	Wo	CS	12	23.9	1.74	.021	.....	.....	168.0	.....	RS	Int	12	23.9	1.74	.021	.....	23
24	Mercury	WR	Gem	18.4	Tra	1	N	21.0	8	1	$\frac{1}{8}$	8	Own	H	Mo	Mo	CS	12	23.4	1.74	.020	.....	.....	163.0	40.0	RS	Int	12	23.4	1.74	.020	.....	24
25	Nash-Ambassador 600 42-40	WR	Gem	18.2	Tra	2	N	.....	0 to $\frac{1}{2}$	0 to $\frac{1}{2}$	0 to $\frac{1}{16}$	$5\frac{1}{2}$	Ben	H	Mo	Mo	CI	9	20.5	$1\frac{3}{4}$	$\frac{3}{16}$	.....	.....	143.5	.....	RS	Int	9	20.5	$1\frac{3}{4}$	$\frac{3}{16}$	.....	25
26	Nash-Ambassador 6 42-60	WR	Gem	18.2	Tra	2	N	19.0	0 to N$1\frac{1}{2}$	$\frac{1}{4}$ to $\frac{3}{4}$	$\frac{1}{32}$ to $\frac{3}{32}$	$4\frac{1}{2}$	Ben	H	Mo	Mo	CI	10	22.0	2	$\frac{1}{16}$	.010	.010	176.0	47.0	RS	Int	10	22.0	2	$\frac{1}{16}$	.010	26
27	Nash-Ambassador 8 42-80	WR	Gem	20.2	Tra	2	N	19.7	0 to N$1\frac{1}{2}$	$\frac{1}{4}$ to $\frac{3}{4}$	$\frac{1}{32}$ to $\frac{3}{32}$	$4\frac{1}{2}$	Ben	H	Mo	Mo	CI	10	22.0	2	$\frac{1}{16}$	.010	.010	176.0	47.0	RS	Int	10	22.0	2	$\frac{1}{16}$	.010	27
28	Oldsmobile-Special Six 66	WR	Sag	19.0	Tra	2	N	18.5	0 to N$\frac{3}{4}$	N$1\frac{1}{4}$ to +$\frac{3}{4}$	$\frac{1}{8}$ to $\frac{1}{4}$	4° 51′ 10″	Var	H	Mo	Mo	CS	11	21.3	(k)	$\frac{3}{16}$	.015	.015	159.8	44.0	RS	Int	11	21.3	$1\frac{3}{4}$	$\frac{3}{16}$	.015	28
29	Oldsmobile-Dynamic Six 76	WR	Sag	19.0	Tra	2	N	19.7	0 to N$\frac{3}{4}$	N$1\frac{1}{4}$ to +$\frac{3}{4}$	$\frac{1}{16}$ to $\frac{1}{8}$	4° 51′ 10″	Var	H	Mo	Mo	CS	11	21.3	(k)	$\frac{3}{16}$	.015	.015	159.8	44.0	RS	Int	11	21.3	$1\frac{3}{4}$	$\frac{3}{16}$	.015	29
30	Oldsmobile-Special 8 68	WR	Sag	19.0	Tra	2	N	18.5	0 to N$\frac{3}{4}$	N$1\frac{1}{4}$ to +$\frac{3}{4}$	$\frac{1}{16}$ to $\frac{1}{8}$	4° 51′ 10″	Var	H	Mo	Mo	CS	11	21.3	(k)	$\frac{3}{16}$	.015	.015	159.8	44.0	RS	Int	11	21.3	$1\frac{3}{4}$	$\frac{3}{16}$	.015	30
31	Oldsmobile-Dynamic 8 78	WR	Sag	19.0	Tra	2	N	19.7	0 to N$\frac{3}{4}$	N$1\frac{1}{4}$ to +$\frac{3}{4}$	$\frac{1}{16}$ to $\frac{1}{8}$	4° 51′ 10″	Var	H	Mo	Mo	CS	11	21.3	(l)	$\frac{3}{16}$	.015	.015	181.1	44.0	RS	Int	11	21.3	2	$\frac{3}{16}$	.015	31
32	Oldsmobile-Custom 8 98	WR	Sag	19.0	Tra	2	N	21.5	0 to N$\frac{3}{4}$	N$1\frac{1}{4}$ to +$\frac{3}{4}$	$\frac{1}{16}$ to $\frac{1}{8}$	4° 51′ 10″	Var	H	Mo	Mo	CS	11	21.3	(l)	$\frac{3}{16}$	.015	.015	181.1	44.0	RS	Int	11	21.3	2	$\frac{3}{16}$	.015	32
33	Packard-Six 2000-2020	WR	Own	20.2	.....	.....	.....	.....	(m)	(p)	(s)	0+$\frac{1}{8}$−0	(u)	Ben	H	.....	.....	Cen	(x)	(aa)	$1\frac{3}{4}$	$\frac{3}{16}$	.....	.....	165.0	.....	RS	Int	(x)	(aa)	$1\frac{3}{4}$	$\frac{3}{16}$	.....	33
34	Packard-Eight 2001-2021	WR	Own	20.2	.....	.....	.....	.....	(n)	(p)	(s)	0+$\frac{1}{8}$−0	(u)	Ben	H	.....	.....	Cen	12	$24\frac{1}{2}$	$1\frac{3}{4}$	$\frac{3}{16}$	.....	.....	171.5	.....	RS	Int	12	$24\frac{1}{2}$	$1\frac{3}{4}$	$\frac{3}{16}$	.....	34
35	Packard-Sup. 8 2003-23-4-5	WR	Own	20.2	.....	.....	.....	.....	(o)	(r)	(t)	0+$\frac{1}{8}$−0	(v)	Ben	H	.....	.....	Cen	12	(bb)	(cc)	$\frac{3}{16}$	.....	.....	(dd)	.....	RS	Int	12	(bb)	(cc)	$\frac{3}{16}$	.....	35
36	Packard-Cus. Sup. 8 2006-7-8	WR	Own	20.2	.....	.....	.....	.....	(o)	(r)	(t)	0+$\frac{1}{8}$−0	(v)	Ben	H	.....	.....	Cen	12	(bb)	(cc)	$\frac{3}{16}$	.....	.....	(dd)	.....	RS	Int	12	(bb)	(cc)	$\frac{3}{16}$	.....	36
37	Plymouth-DeL. & Spec. DL. P-14	WR	Gem	18.2	No	2	.....	.....	N1 to +1	0 to +$\frac{3}{4}$	0 to $\frac{1}{16}$	$4\frac{3}{4}$ to 6	Loc	H	Mo	Mo	Cen	10	18	2	$\frac{13}{32}$	.012	.005	144.0	40.0	PS	Ext	6	$16\frac{11}{16}$	2	$\frac{3}{32}$	.017	37
38	Pontiac-DeLuxe 6 42-25	WR	Sag	19.0	Tra	2	N	38.6	N$1\frac{1}{2}$ to N1	0 to 1	0 to $\frac{1}{8}$	5	Ben	H	Mo	Mo	CS	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	.015	159.0	44.0	RS	Int	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	38
39	Pontiac-Stream. 6 42-26	WR	Sag	19.0	Tra	2	N	40.0	N$1\frac{1}{2}$ to N1	0 to 1	0 to $\frac{1}{8}$	5	Ben	H	Mo	Mo	CS	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	.015	159.0	44.0	RS	Int	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	39
40	Pontiac-DeLuxe 8 42-27	WR	Sag	19.0	Tra	2	N	38.6	N$1\frac{1}{2}$ to N1	0	0 to $\frac{1}{8}$	5	Ben	H	Mo	Mo	CS	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	.015	159.0	44.0	RS	Int	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	40
41	Pontiac-Stream. 8 42-28	WR	Sag	19.0	Tra	2	N	40.0	N$1\frac{1}{2}$ to N1	0	0 to $\frac{1}{16}$	5	Ben	H	Mo	Mo	CS	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	.015	159.0	44.0	RS	Int	11	$21\frac{5}{16}$	(ee)	$\frac{3}{16}$	.015	41
42	Studebaker Champion 6 4G	CL	Ross	14.2	Tra	3	Y	19.2	1 to 2	$\frac{1}{2}$	$\frac{1}{16}$ to $\frac{1}{8}$	$5\frac{1}{2}$	Loc	H	Mo	Mo	Com	9	$17\frac{3}{4}$	$1\frac{3}{4}$	$\frac{3}{16}$	.010	.005	124.0	43.0	RS	Int	9	$17\frac{3}{4}$	$1\frac{3}{4}$	$\frac{3}{16}$	.....	42
43	Studebaker-Commander 6 12A	CL	Ross	14.0	Tra	3	Y	21.5	N$1\frac{1}{4}$ to N$3\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{16}$ to $\frac{1}{8}$	$5\frac{1}{2}$	Loc	H	Mo	Mo	Com	11	$19\frac{11}{16}$	2	$\frac{3}{16}$	.010	.005	150.0	45.0	RS	Int	11	$19\frac{11}{16}$	2	$\frac{3}{16}$	.....	43
44	Studebaker-President 8 8C	CL	Ross	14.0	Tra	3	Y	23.2	N$1\frac{1}{4}$ to N$3\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{16}$ to $\frac{1}{8}$	$5\frac{1}{2}$	Loc	H	Mo	Mo	Com	11	$19\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.010	.005	169.0	45.0	RS	Int	11	$19\frac{11}{16}$	$2\frac{1}{4}$	$\frac{3}{16}$	.....	44
45	Willys-Americar 442	CL	Ross	.....	Lg	1	N	18.0	3	2	$\frac{3}{32}$ to $\frac{5}{32}$	$7\frac{1}{2}$	Ben	H	Mo	Mo	CN	9	$16\frac{33}{64}$	$1\frac{3}{4}$	$\frac{3}{16}$	.008	.005	118.0	43.0	RS	Int	9	$16\frac{33}{64}$	$1\frac{3}{4}$	$\frac{3}{16}$	.....	45

ABBREVIATIONS:

(a)—Model 61, 63—19.6 ft., 62—20.1 ft., 60 S—20.6 ft.
(aa)—Front 24½ in., rear 22⅝ in.
(b)—Model 67—22.3 ft., 75—22 ft.
(bb)—Models 2003, 6, 23—24½ in.; models 2004, 5, 7, 8—26 in.
(c)—Rear brakes 2 in., front brakes 2¼ in.
(cc)—Models 2003, 6—Front 2¼ in., rear 2 in.; model 2023—front and rear 2 in.; models 2004, 5, 7, 8—front and rear 2¼ in.
(d)—Rear brakes 2½ in., front brakes 2¼ in.
(dd)—Models 2003, 6—208.25 sq. in., 2023—196 sq. in., models 2004, 5, 7, 8—234 sq. in.
(e)—Cast iron rim with steel web
(ee)—Front 2 in., rear 1¾ in.
(f)—Adjust to slight drag, back off four notches
(g)—Front 25⅛ in.; rear 22⅜ in.
(h)—Rear shoes on rear wheels, toe and heel .007 in All other shoes front and rear, toe .007 in., heel .006 in.
(i)—Floating just clear of drag
(k)—Front 2 in., rear 1¾ in.
(l)—Front 2¼ in.; rear 2 in.
(m)—On model 2030—21 ft., 2020—20.5 ft.
(n)—On model 2001—21 ft., 2021—21.2 ft.
(o)—On model 2003, 6, 23—22 ft., 2004, 7—24 ft., 2005, 8—24.5 ft.
(p)—On model 2000—N1±½; 2020—Pos. ¼±½
(r)—On model 2004, 5, 7, 8, 23—N1¼±½; 2003, 6—N2±½
(s)—On model 2000—Pos. ¼±½; on model 2020—R.H.—0+¾−¼, L.H. Minus 0+1−0
(t)—On model 2004, 5, 7, 8, 23—R.H.—0+¾−¼, L.H.—Minus 0+1−0, on model 2003, 6—¼±½
(u)—Model 2000—5° 35′; 2020—2½°
(v)—Models 2004, 5, 7, 8, 23—2½°; models 2003, 6—5° 35′
(x)—12 in. front, 11 in. rear
B-D—Bendix or Deleo
Ben—Bendix Products Div.
BW—Ball bearing, worm and nut
Cen—Centrifuse
Cl—Cast iron
CL—Cam and lever
Com—Composite
CN—Chrome nickel alloy iron
Cr—Cross relay
CS—Cast iron braking surface in steel drum
D—Duo Automatic
Ext—External contracting
Gem—Gemmer Manufacturing Co.
H—Hydraulic
Haw—Hawley
Int—Internal expanding
Lg—Longitudinal
Loc—Lockheed
M—Mechanical
Mo—Moulded
N—Negative
No—No or None
PS—Propeller shaft, rear of transmission
Ross—Ross Gear & Tool Co.
RS—Rear service brakes
Sag—Saginaw
St—Steel
Tra—Transverse
Var—Various
Wo—Woven
WR—Worm and roller
Y—Yes

MEN and



Atlas multi-spindle drilling machine for small drills and taps

ATLAS PRESS COMPANY, Kalamazoo, Mich., is contributing to the general step-up in production speed by introducing a new series of two, three and four spindle drilling machines suitable for small-hole drilling and tapping operations.

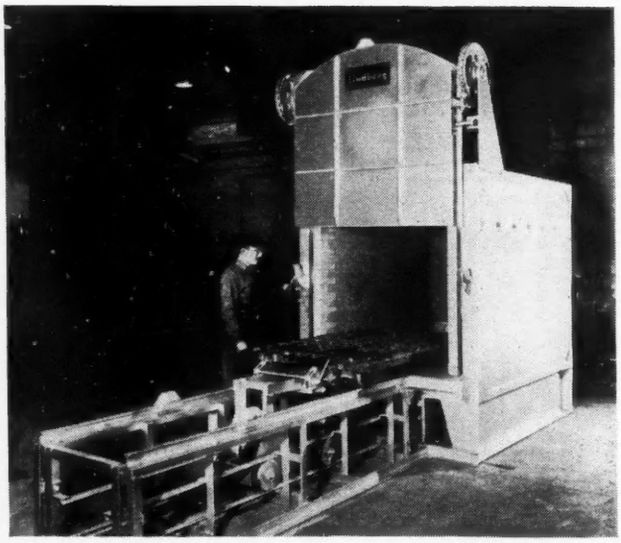
These machines have individual motor mountings for each drilling head and a new type of positioning control with crank handle. The drilling heads incorporate the ball bearing equipped floating drive featured in all Atlas heavy duty drill presses.

Table weight of the three and four spindle machines is reported at 575 pounds, furnishing a solid support for handling jigs, fixtures and parts in production quantities. Spindle centers are 15, 18 and 13 inches apart on the three type machines, respectively. Table top to Jacobs chuck is 26 inches; column to center of spindle distance is 7½ inches.

A SPEED-UP in the heat treatment of non-ferrous parts, such as aluminum alloy pieces used in aircraft construction, is promised by the Lindberg Engineering Co., of Chicago, as they introduce an automatic roller grid for use in charging its "Cyclone" forced convection box type furnace.

In operation, the grid is automatically engaged within the furnace by a carriage, powered by an air cylinder. This quickly pulls it on tracks from the work chamber out into the open, where the work can be rapidly removed for quenching and the grid reloaded. It is then automatically backed into the work chamber, disengaged and the carriage retracted, permitting the hand controlled, air operated door to be lowered into place.

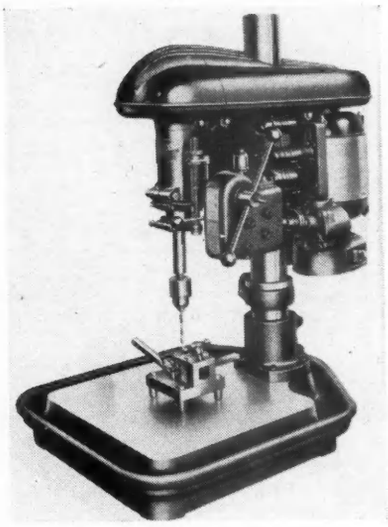
Heating by the "Cyclone" principle, employs a high velocity fan, forcing large volumes of air at speeds said to be as high as two miles a minute over the electrical heating elements and through all parts of the work chamber. The heating elements are of coiled nickel chrome wire. They are located in a separate chamber to permit quick replacement without cooling the furnace and also to prevent radiation directly to the charge.



Automatic roller grid for heat treating in "Cyclone" furnace

THE DELTA MANUFACTURING CO., of Milwaukee, Wis., has just added to its line an improved low-cost power feed drill press having a very wide range of feeds, due to the design of the power feed, which operates directly from the bottom drive of the motor. This arrangement makes possible a feed range from 0.0010 to 0.016 inches per spindle revolution, in the slow-speed models and from 0.0005 to 0.009 in the high-speed machines.

Strong points claimed for the design include: bronze gear with specially hardened and ground steel worm to assure positive stopping and long life; quick hand traverse from starting position to work, instant switching from power to hand feed without changing or removing parts, safety lock, adjustable automatic stop and return. Two 4-step cone pulleys and a special belt tension release make speed changes quick and safe.

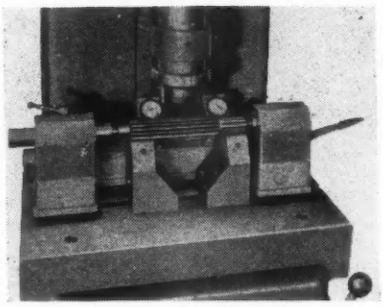


Delta power-feed drill press has wide range of speeds

Single and multiple spindle 17-inch units, in slow-speed and high-speed models, with table-raising or head-raising mechanisms are included in the line. Either Delta or standard NEMA frame motors are available.

ADAPTABILITY to various uses outside straight production work is one of the advantages which the Denison En-

MACHINES

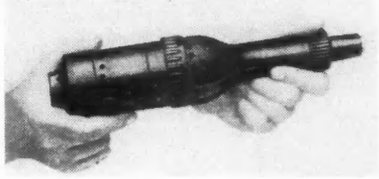


Denison production press adaptable for straightening operations.

gineering Company, Columbus, Ohio, claims for its 15-ton, C-type HydrOILic press. An instance is the delicate job of correcting irregularities of a few thousandths in a short, hardened steel shaft.

For this purpose the shaft is set on centers under the raised ram of the press and gages, calibrated in thousandths, are moved along the shaft until they indicate a point where straightening is needed. The ram is then advanced to the shaft and the centers are lowered with the shaft to a straightening block. Additional movement of the control lever—which controls the tonnage applied on the ram in proportion to its movement—then applies the force needed for the corrective set of the shaft. The gages measure the deflection during the operation.

SEVERAL features combine to make the "Precise 35" midget electric tool especially interesting. The Precise Products Corporation, Racine, Wis.,



The "Precise 35" electric hand tool has a plastic case

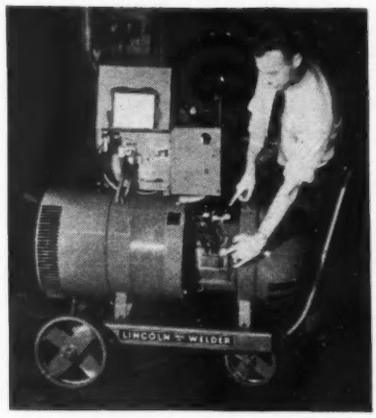
which is about to announce this brand new hand tool has incorporated in it several features, including a case of practically unbreakable plastic material for the purpose—among others—of eliminating any danger of shock from current leakage; also a self-aligning, insulating elastic coupling.

The tool is 11½ inches long, 2¼ inches in diameter and weighs 35 ounces. It is of four-bearing construction, the bearing chambers being completely enclosed against dirt, avoiding evaporation of lubricant and permitting the forced ventilation from the fan to keep the motor parts clean without the use of an air filter. It is powered with a 1/7 hp. universal motor, running 20,000-35,000 r.p.m. under load. Owing to its streamlined shape, it is suitable for internal work through openings as small as 1 13/32 inch diameter and as much as 6 inches in depth.

Companion units are a hand motor with reduction gear giving work speeds of 1500-2500 r.p.m., and a high-speed screw driver incorporating a clutch for fixing and removing screws and nuts up to one-third inch thread diameter.

PROTECTION against burn-outs in arc welding machines is offered by The Lincoln Electric Company, Cleveland, Ohio, in a new control device which guards against heat, excessive current or both. The device is of particular advantage in production welding where continuous operation is required at the maximum current which the machine will safely deliver.

The device embraces a pair of current transformers whose primaries are connected in series with the motor leads, while the secondaries supply power to operate two snap-action thermostats which are mounted on the motor lamination. Conduction of heat, as well as current passing through the coils actuates the breakers, which are automatically reset when the motor cools or the current is reduced below the predetermined minimum. However, a



Lincoln thermostatic control for arc welders

special circuit permits the starter button to be held "in" after the thermostats have been tripped, allowing the machine to turn over with no load to speed up cooling, after the trouble has been rectified.

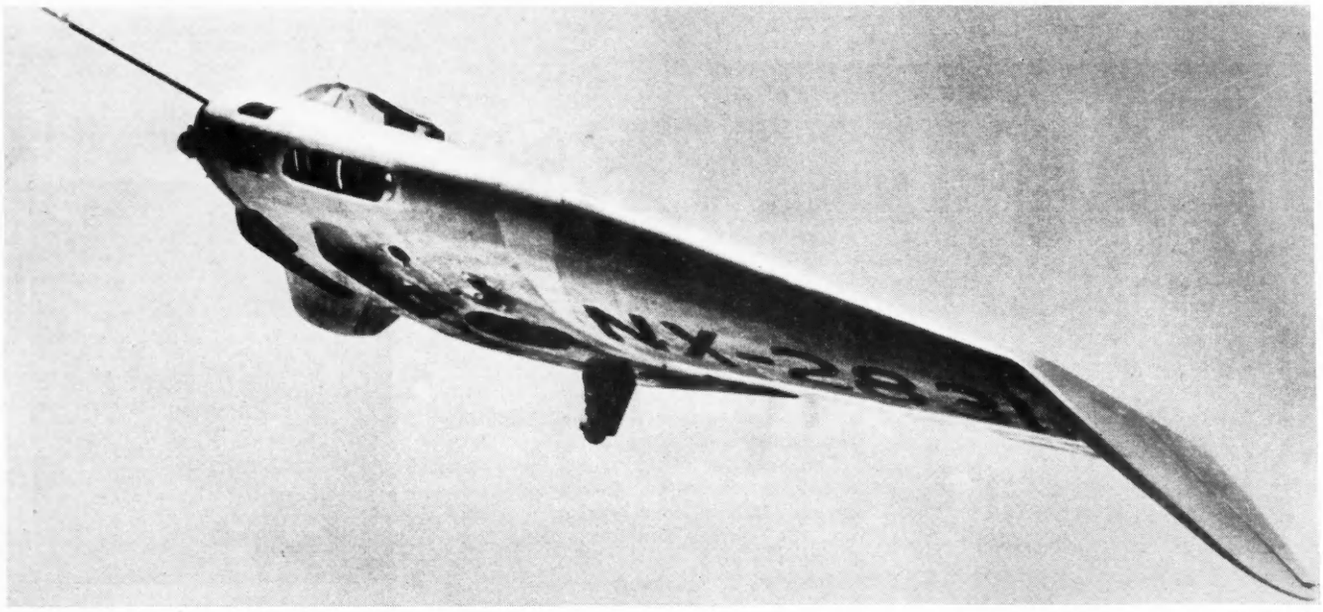
ADVANCED engineering practice is incorporated throughout in the machines and tools recently brought out by the American Broach & Machine Co., of Ann Arbor, Mich., for rifling 20 m/m cannon. These pieces have a bore of approximately 70 inches overall length and a broached spline section of approximately 60 inches. The time required for broaching, floor to floor, is about ten minutes, a cutting stroke of 8 feet per minute proving satisfactory.

The broaches used are about 48 inches long and can be serviced by ordinary broach grinding equipment, without resorting to specially designed equipment. The pulling shank is detachable, so that the length of the tool itself is not abnormal, and it can be placed on centers and ground in the conventional manner.

The machine is of the pull type, hydraulically operated. This equipment fills out the line of broaching equipment for rifling cannon up to 105 m/m

(*Turn to page 62, please*)

American Hydraulic pull broach rifling machine for 20 m/m cannon



International Photo

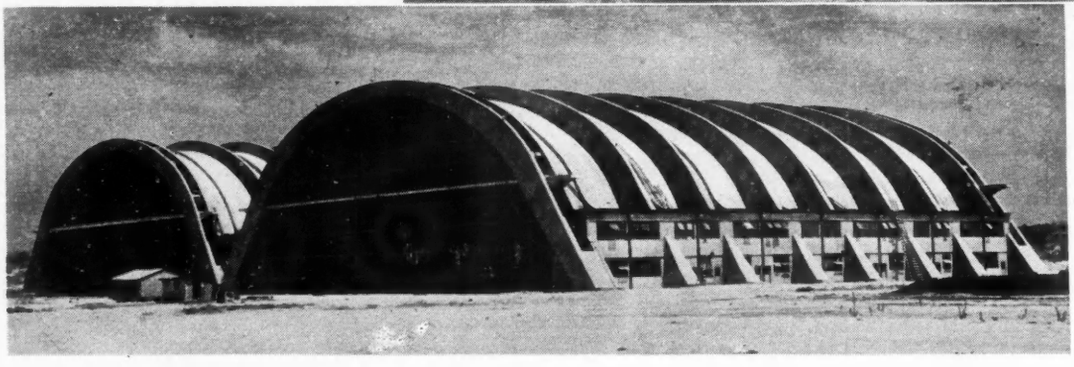
This new "flying wing" plane was developed by the Northrup Aircraft Co., of Hawthorne, Calif. It has no fuselage or tail surfaces. The powerplant and personnel are housed within the contours of the airfoil

Designed for Defense

Acme Photo

The AT-9 shown at the right is for advanced training of student pilots who are ready to move into the multi-engined planes. The AT-9 is an all-metal craft with retractible landing gear and side-by-side seats

This new type of hangar is being built by the Navy at North Island, San Diego, Calif. They are designed for heavier than air craft and built of reinforced concrete with numerous protective features. They are as tall as a seven story building



Wide World Photo

Appeal Made to Save Alloy Content in Scrap Steels

OPM Urges Segregation of Various Grades at Plants to Permit Reclamation; Check Government and Private Stocks

By W. C. Hirsch

One by one, loose ends that remain in the metal control set-up are being brought together by the Office of Production Management. Characterizing its action as "the most far-reaching yet taken," OPM forbade the use of copper in more than a hundred civilian products, the most notable being building materials, and scaled it down in others. Allocation of lead has been tightened, and a compulsory reserve pool set up. That OPM does not hesitate to lift maximum prices "when this is necessary to maintain and expand supply" was shown in the case of zinc, the maximum price of which has been raised by $20 a net ton.

The two outstanding factors of limitation in the output of steel are labor troubles and the inadequate supply of scrap. A most constructive step toward remedying the latter shortcoming is an appeal for alloy scrap conservation, sponsored by R. C. Allen, deputy chief of the OPM Iron and Steel Branch and widely publicized by International Nickel Company. "In many manufacturing plants from 20 to 40 per cent of the alloy steel or alloy iron delivered is lost as scrap during conversion," says this appeal, "and in some products the amount of scrap may run 70 and 80 per cent.

"The alloy content of such scrap is to a large extent reclaimable, but at the present time a large part of this alloy content is being permanently lost because it is mixed with other metal scrap. This is particularly true in the case of machine turnings or chips, flashings from forgings, etc. Alloy losses in the case of bar ends, punching rejects and similar heavy melting scrap, while smaller, are still relatively high."

It is pointed out that small plants usually keep non-ferrous metals, such as brass and aluminum, separate from iron and steel, and it should be possible to educate machine tool operators to carry this a step further and segregate alloy steel scrap from that of simple carbon steels; and knowing the compositions of the parts they are working on, to further segregate the alloy steel scrap by types and grades. A comprehensive survey of alloy steel scrap sources and conservation methods is under way.

The flow of scrap direct from producers to steel mills is decidedly on the uptrend, this in spite of strenuous opposition from middlemen, who stress the unprofitability of their business if the handling of manufacturers' scrap is taken away from them. The recent shutdown of one of the most important units of the second largest steel producer because of inability to obtain sufficient scrap brought into the foreground the critical situation resulting from inability to "lick" the scrap problem.

On the whole, the trade is adapting itself rapidly to defense priority regulations. As one metal refiner puts it, it has become a case of "no tickee, no washee." If the prospective buyer hasn't a high priority rating and certificate to that effect, he just can't expect to have his order filled. A reassuring note is seen in the Washington announcement that both governmental and private inventories are being checked to assure proper timing of deliveries for defense needs.

Although official confirmation is lacking, there are persistent reports that action is being considered by the Supplies Priorities and Allocation Board to prevent accumulation of excessive inventories by the Army and Navy. Complaints of automobile manufacturers that they are unable to obtain their requirements of hot-rolled sheets, sharply scaled down as they are, continue to multiply. Non-integrated sheet mills are hampered by their inability to obtain adequate supplies of semi-finished steel.

Car Makers Set Up A Parts Committee

The Automobile Manufacturers Association has set up a Replacement Parts Committee, to the chairmanship of which President Alvan Macauley has appointed J. F. Page, of the Packard Motor Car Co. One objective of the Committee will be to cooperate closely with OPM officials in working out service and replacement problems with a view to keeping highway transport equipment at its best.

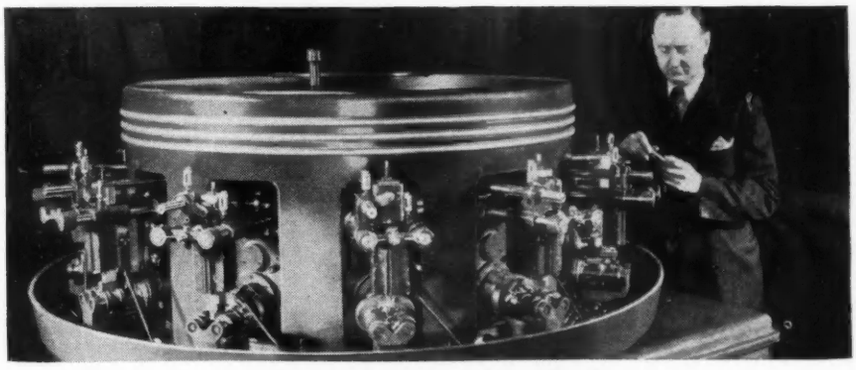
Members of the Committee in addition to Page include F. C. Bahr (Chrysler), A. Benhoff (Willys-Overland), J. W. Dineen (General Motors), Karl M. Greiner (Nash), E. C. Mendler (Studebaker) and T. H. Stambaugh (Hudson). Oliver Baker, of the A.M.A. staff, is secretary.

Ford to Make "Jeep"

An agreement under which the Ford Motor Co. and Willys-Overland Motors, Inc., will both produce identical models of the quarter-ton "jeep" reconnaissance Army truck has been negotiated by the War Department in an effort to double the present production rate. The Willys Co. has agreed to furnish complete drawings, licenses, patents, and other manufacturing information to Ford without cost.

Aircraft Committee Adds To Standardization List

The National Aircraft Standards Committee meeting in New York, November 11-13 will discuss standardization of six additional items which go into airplane manufacture. Within the past year the committee has standardized 21 items.



One Millionth-of-An-Inch

In this new type machine, fine abrasive stones are held gently against the rotating and oscillating surface of the work, to superfinish De Soto's engine tappets to millionth-of-an-inch smoothness.

CIO Refuses to Handle Parts from AFL Plants

Suppliers Begin to Feel Union Strife for Control of Workers at Small Factories; Willys Becomes Closed Shop

Use of its strength in major automotive plants to organize the smaller plants of suppliers has been employed by the UAW-CIO with some effectiveness of late in Michigan. Recent labor disputes at the Hillsdale Steel Products Co. and the Novi Equipment Co. have brought charges by the UAW-AFL that the UAW-CIO is endeavoring to drive all competing unions out of the automotive field by refusal of CIO members to handle parts produced in AFL plants of suppliers.

The UAW-AFL won an NLRB election from the UAW-CIO by four votes at the Hillsdale Steel Products Co. last April and the AFL was granted a preferential shop contract. The UAW-CIO called a strike at the Hillsdale plant, claiming that 11 employes who were dismissed for an unauthorized work stoppage were being discriminated against for CIO membership. The Hillsdale plant remained in production with 700 of the 800 workers continuing on the job. But the UAW-CIO, in order to force reinstatement of the discharged men, declared a boycott at the Spicer Mfg. Co. in Toledo on the transmission parts that were being made at Hillsdale for Army tanks, half-track cars and "jeeps." The Spicer plant has a contract with the UAW-CIO and the refusal of the men to handle parts from Spicer's Hillsdale subsidiary made 500 men idle in the transmission department.

As Spicer produces 70 per cent of the nation's tank transmissions, the strike was certified to the National Defense Mediation Board and R. J. Thomas, president of the UAW-CIO, called off the 8-day strike pending the mediation board hearing.

Similar tactics were employed by the UAW-CIO at the Novi Equipment Co., a small plant with 220 employes which supplies Ford Motor Co. with tractor governors and truck accelerators and makes parts for the Chrysler tank arsenal. The CIO won an informal plant election last June, but the AFL had petitioned for an NLRB poll. Demanding exclusive bargaining rights, the CIO struck. An impasse was reached, with the plant closed down, until UAW-CIO organizers told the AFL workers that Ford employes, who have a closed shop contract under the UAW-CIO, would refuse to work on any parts from the Novi plant unless produced under a CIO contract. AFL members were told that Ford dies would be moved from the Novi plant and transferred to another establishment having a CIO contract unless they joined the CIO.

A UAW-CIO representative is reported to have told the AFL members, "You can join the CIO and go back to work or you can remain in the AFL and put your boss out of business. The Ford workers are putting out a car with a union label and unless you go CIO, the parts you make will be made somewhere else by CIO workers."

After this ultimatum, nearly 100 UAW-AFL members voted to switch to the CIO and the 9-day strike was ended. The management then agreed to sign a contract following an election of officers by the local.

Whether the UAW-CIO will use sim-

(*Turn to page* 58, *please*)

ADVERTISING

George L. Briggs has joined the copartnership of Behel and Waldie, Chicago advertising. Consequently the firm name has been changed to Behel and Waldie and Briggs.

James R. Adams, executive vice-president of MacManus, John & Adams, Inc., Detroit advertising agency, has been appointed to the Port of Detroit Commission by Gov. Van Wagoner, of Michigan.

George W. Davis, account executive on the Packard account for Young & Rubicam, Inc., has been named a vice-president of the agency.

Car and Parts Exports Up 22.5 Per Cent

Exports of automobiles, parts and accessories rose sharply in August to total value of $25,306,100 for a gain approaching 70 per cent compared with the corresponding month last year. The major movement was in commercial vehicles, of which 13,857 units were shipped out of the country, to the value of $10,600,526, compared with 4,179 units, worth $4,707,086 in August, 1940. Passenger cars were exported to the number of 6,439, worth $4,701,656, against 2,221 a year ago, valued at $1,423,530.

During the eight months ended with August the value of automobiles, parts and accessories exported was $201,951,030. Compared with the export valuation of $164,742,447 for the first eight months of 1940, the gain this year to date amounted to 22½ per cent.

Harold F. McCormick

Harold F. McCormick, 69, board chairman and former president of International Harvester Co., died Oct. 16 at Beverly Hills, Cal., following a long illness. His son, Fowler McCormick, is now president of International Harvester.

New Passenger Car Registrations

	AUGUST 1941	JULY 1941	AUGUST 1940	EIGHT MONTHS 1941	EIGHT MONTHS 1940	Per Cent Change, 8 Months, 1941 over 1940	Per Cent of Total Eight Months 1941	Per Cent of Total Eight Months 1940	ELEVEN MONTHS MODEL YEAR 1941	ELEVEN MONTHS MODEL YEAR 1940	Per Cent Change
Chevrolet	57,326	95,110	55,079	748,913	590,028	+ 26.9	24.15	25.20	981,214	799,594	+ 22.7
Ford	52,895	65,485	35,168	500,922	385,991	+ 29.8	16.15	16.49	645,707	530,362	+ 21.8
Plymouth	23,018	45,758	22,039	373,547	304,061	+ 22.8	12.04	12.99	490,161	378,636	+ 29.4
Buick	17,137	33,383	16,604	260,435	186,335	+ 39.8	8.40	7.96	349,448	264,449	+ 32.1
Pontiac	15,710	28,895	11,877	239,549	152,474	+ 58.1	7.72	6.51	311,124	211,490	+ 47.1
Oldsmobile	11,854	24,624	11,246	195,966	131,919	+ 48.5	6.32	5.63	256,223	185,441	+ 38.2
Dodge	15,968	21,213	14,154	174,065	146,466	+ 18.8	5.61	6.26	217,723	180,605	+ 20.5
Chrysler	10,349	14,874	6,009	120,326	69,439	+ 73.2	3.88	2.97	147,928	85,508	+ 72.9
Studebaker	9,623	13,051	6,268	89,679	68,524	+ 30.9	2.89	2.93	116,597	95,698	+ 21.8
De Soto	7,565	9,184	5,611	74,495	50,632	+ 47.1	2.40	2.16	92,414	62,500	+ 47.8
Mercury	5,736	8,704	5,495	67,158	57,997	+ 15.8	2.16	2.48	86,754	80,015	+ 8.4
Nash	3,677	7,583	3,558	65,273	37,546	+ 73.8	2.10	1.60	78,398	52,216	+ 50.1
Hudson	4,677	6,319	5,599	56,827	52,494	+ 8.2	1.83	2.24	77,221	76,664	+ .7
Cadillac	3,277	6,970	2,111	49,473	22,930	+115.7	1.60	.98	63,352	34,198	+ 85.2
Packard	4,202	5,922	6,028	49,314	49,915	— 1.2	1.59	2.13	67,858	71,629	— 5.3
Willys-Americar	2,211	2,415	1,910	17,877	15,186	+ 17.7	.58	.65	22,722	21,094	+ 7.7
Lincoln	1,099	1,962	1,498	14,844	14,501	+ 2.4	.48	.62	20,307	20,353	— .3
Crosley	198	120	34	645	291	+121.6	.03	.01	756	426	+ 77.4
Graham	14	31	237	506	1,119	— 54.8	.02	.05	1,037	1,432	— 27.6
Bantam	14	9	62	104	646	— 83.9	.....	.03	203	878	— 76.9
Miscellaneous	45	203	444	1,535	2,597	— 40.9	.05	.11	2,681	3,204	— 16.4
Total	245,595	391,795	211,031	3,101,453	2,341,091	+ 32.5	100.00	100.00	4,029,828	3,156,390	+ 27.6
Chrysler Corp.	55,900	91,029	47,813	742,433	570,598	+ 30.1	23.94	24.37	948,226	707,249	+ 34.1
Ford Motors	59,730	76,151	42,161	582,924	458,489	+ 27.1	18.80	19.58	752,768	630,730	+ 19.3
General Motors Corp.	105,304	188,982	96,917	1,494,336	1,083,686	+ 37.9	48.18	46.29	1,961,361	1,495,170	+ 31.2
All Others	24,661	35,633	24,140	281,760	228,318	+ 23.4	9.08	9.76	367,473	323,241	+ 13.7

JANUARY PASSENGER CAR ALLOTMENTS
(Non-Military Use)

	Allotments January, 1942	Percentage Decrease of Allotments Below January, 1941 Production	Allotment First 6 Months 1942 Model Year	Percentage Decrease of Allotments Below First 6 Months Production of 1941 Model Year
GENERAL MOTORS COMPANY				
Chevrolet	45,180	56.6%	270,854	37.0%
Buick	16,402	55.2	98,330	43.9
Pontiac	14,358	49.7	86,076	40.5
Oldsmobile	11,753	54.8	70,459	41.8
Cadillac	2,874	54.9	17,230	35.2
Total General Motors Corp.	90,567	55.1%	542,949	39.5%
CHRYSLER CORP.				
Plymouth	25,184	51.7	150,980	43.5%
Dodge	11,863	57.1	71,120	33.3
Chrysler	6,028	66.9	36,137	44.5
De Soto	4,196	55.3	25,154	40.9
Total Chrysler Corp.	47,271	56.0%	283,391	41.1%
FORD MOTOR CO.				
Ford	32,307	53.2%	193,677	33.4%
Mercury	4,426	60.2	26,534	37.7
Lincoln-Zephyr	1,276	46.8	7,652	35.9
Total Ford Motor Co.	38,009	54.0%	227,863	34.0%
Total General Motors, Chrysler and Ford	175,847	55.1%	1,054,203	38.9%
OTHER MOTOR COMPANIES				
Studebaker	8,834	+18.0%	52,957	17.9%
Hudson	6,476	+11.4	38,826	26.6
Nash	5,500	20.8	32,972	13.0
Packard	5,771	+28.8	34,598	8.0
Willys-Overland	1,944	8.1	11,656	+ 3.2
Crosley	476	.....	2,853	+1,196.8
Total Other Companies	29,001	+ 8.0%	173,862	14.9%
Grand Total	204,848	51.0%	1,228,065	36.3%

Auto Makers Step-Up Defense Production; Get New Orders

Bomber Parts and Assemblies Plants in Full Swing; Chrysler, GM, Ford Will Start M-4 Tank Production

Briggs Mfg. Co. will manufacture bomber gun turrets in the new plant for which the Defense Plant Corp. allocated $8,848,542 last month. Construction will begin in November on the blackout type factory to be built in northeast Detroit near the Briggs Eight Mile Road plant. The main one-story building will be 1,160 x 350 ft. and the plant will contain 450,000 sq. ft. of floor area. Bomb shelters will be an added feature.

Not awaiting completion of the new plant, Briggs will begin production immediately of the turrets in the company's Roosevelt Ave. plant on a $3,250,000 educational order. An additional $23,000,000 order also has been received. The new plant may employ more than 5,000 men when full production is reached and more than 100 sub-contractors will participate in the project.

Plans to double U. S. tank production, as recently voiced by President Roosevelt, find Chrysler Corp. preparing for an eventful peak production of 40 medium tanks daily rather than the 15 per day originally planned.

Early in 1942 Chrysler probably will switch from the current M-3 medium tank to the new M-4 version which has been developed by the Ordnance Dept. This is understood to be a lighter and more streamlined type of medium tank. General Motors and Ford, which are preparing for tank production, will make the M-4 type. Production of heavy tanks, which Ford and GM also are getting ready to manufacture, probably will be on a limited basis. Baldwin Locomotive Works has built an experimental model under 60 tons but the Ordnance Dept. does not plan to contract for very many at present.

GM has made a formal proposition to the government for the manufacture of tanks in Flint, under direction of the Fisher Body Division, assisted by the Buick Division.

Continental Motors Corp. has had its

(*Turn to page* 75, *please*)

CALENDAR

Conventions and Meetings

Society of Automotive Engineers, Aircraft Production Meeting, Los Angeles .....Oct. 30-Nov. 1
SAE West Coast Transportation Mtg., San Francisco .....Nov. 5-6
SAE Natl. Transportation & Maintenance Mtg., Cleveland.....Nov. 13-14
American Die Casting Institute, Cleveland .....Nov. 12
Production Conference, New York City Nov. 18-19
National Assoc. of Manufacturers, New York City .....Dec. 3-5
Natl. Automobile Dealers Assoc., Chicago .....Jan. 19-22
Motor & Equipment Wholesa'ers Assoc., Atlantic City .....Feb. 23-28

Business in Brief

Written by the Guaranty Trust Co. New York, Exclusively for AUTOMOTIVE INDUSTRIES

Relatively stable levels of general business activity reflect expanding production of defense materials and approximately equal decline in other industrial output. The index of *The Journal of Commerce*, without seasonal adjustment, for the week ended Oct. 18 stands provisionally at 127.6 per cent of the 1927-29 average, as against an all-time peak of 128.7 for the preceding week. The seasonally adjusted index of The New York *Times* for the week ended Oct. 11 declined to 126.5 per cent of the estimated normal from 127.4 a week earlier.

Department store sales during the week ended Oct. 18, according to the Federal Reserve compilation, were 7 per cent above the corresponding total last year, as against a similar gain of 13 per cent for the preceding week and 17 per cent for the current year to date.

Contracts awarded for heavy construction during the week ended Oct. 23, totaling $70 millions, were much below the comparable amount last year; but the 1941 total to date is 69 per cent greater than the similar figure a year ago, according to *Engineering News-Record.*

Railway freight loadings in the week ended Oct. 18 totaled 922,884 cars, the largest weekly number this year and 13 per cent above the corresponding total in 1940.

The number of business failures during the week ended Oct. 16 was 178, as compared with 210 for the week before and 262 a year ago, according to the Dun & Bradstreet report.

Electric power production in the week ended Oct. 18 declined from the all-time peak reached a week earlier and was 15.3 per cent greater than the output a year ago, as against a similar advance of 17.7 per cent for the preceding week.

Crude oil production during the same period averaged 4,110,550 barrels daily, 39,600 barrels above the average for the week before and 97,650 barrels more than the currently required output as computed by the Bureau of Mines.

Average daily output of bituminous coal during the week ended Oct. 11 was 1,858,000 tons, as compared with 1,850,000 tons in the preceding week and 1,370,000 tons a year ago.

Debits to deposit accounts reported by banks in leading cities for the week ended Oct. 15 exceeded by 17 per cent the corresponding amount last year.

Professor Fisher's index of wholesale commodity prices for week ended Oct. 17 declined one fractional point to 98.3 per cent of the 1926 average.

Member bank reserve balances dropped $572 millions during the week ended Oct. 22, reflecting chiefly the results of Treasury operations. Estimated excess reserves declined almost equally to $4660 millions, the lowest total in more than two years.

Ford R. Lamb

Ford R. Lamb, 50, executive secretary and past president, American Society of Tool Engineers, died at his home October 26. He was one of the ASTE founders in 1932.

Passenger Car and Truck Production

(U. S. and Canada)

	August 1941	July 1941	August 1940	EIGHT MONTHS 1941	EIGHT MONTHS 1940	EIGHT MONTHS Per Cent Change
Passenger Cars—U. S. and Canada						
Domestic Market—U. S.	77,499	335,884	45,172	2,780,812	2,169,992	+28.1
Foreign Market—U. S.	1,030	7,864	1,651	69,067	73,030	− 5.4
Canada	3,160	3,849	1,510	72,208	77,193	− 6.5
Total	81,689	347,597	48,333	2,922,087	2,320,215	+25.9
Trucks—U. S. and Canada						
Domestic Market—U. S.	58,342	84,054	26,778	633,605	414,805	+52.7
Foreign Market—U. S.	10,729	16,439	2,272	104,239	78,277	+33.2
Canada	14,032	20,805	12,483	122,509	62,180	+97.0
Total	83,103	121,298	41,533	860,353	555,262	+54.9
Total—Domestic Market—U. S.	135,841	419,938	71,950	3,414,417	2,584,797	+32.1
Total—Foreign Market—U. S.	11,759	24,303	3,923	173,306	151,307	+14.5
Total Canada	17,192	24,654	13,993	194,717	139,373	+39.7
Total—Cars and Trucks—U. S. and Canada	164,792	468,895	89,866	3,782,440	2,875,477	+31.5

PUBLICATIONS

The many ways in which self-contained, **high-speed hydraulic machinery** and equipment can help speed production are pictured and described in the new 44-page Watson-Stillman Manual (No. 110-A).*

What, Why and How, published by Norton Co., is a booklet intended primarily for apprentices, trade and technical school students and the many new operators of grinding machines. Norton Co. has also published **Thread Grinding,** a handbook for operators of Jones & Lamson and Ex-Cell-O Thread Grinding Machines.*

Hevi-Duty Electric Co. has a new bulletin, No. HD-1041, on Hevi-Duty **Pit Type Convection Furnaces.***

Zinc In Defense, a new publication by The New Jersey Zinc Co., has been designed to explain the myriad uses for zinc in the Defense Program.*

A weekly stock sheet listing quantities of various standard style **Kennametal carbide tools** carried in stock, has been made available by McKenna Metals Co., 105 Lloyd Ave., Latrobe, Pa.

The 16th edition of A.S.T.M. **Standards on Petroleum Products and Lubricants,** issued annually by the American Society for Testing Materials, 260 S. Broad St., Phila., provides in compact form test methods, specifications, definitions and charts. Single copies are priced at $2.00.

The Rubber Mfrs. Assoc.'s Bulletin No. 17 is designed to illustrate and explain (1) the common causes of tube failures, resulting from injuries or misuse and (2) the principal points essential to maximum tube performance.*

Graham Transmissions, Inc., has issued the **Graham Dial,** a monthly digest of current technical news for industrial executives. Articles presented are chiefly from original engineering sources.*

Bantam Bearings Corp.'s August issue of **The Bearing Engineer** contains three interesting articles on needle and roller bearings. The Bantam company has also put into booklet form the program marking the presentation of the Navy Ordnance Flag and the Navy "E" Award to their company.*

The Frederick Post Co., P. O. Box 803, Chicago, has a new Giant Post Decimal Equivalent Wall Chart. Requests must be made on company letterheads.

Partners in Revere is the title of a booklet issued by Revere Copper and Brass, Inc., giving in detail information regarding its various departments, manufacturing, sales, personnel, etc.*

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

Reynolds Plans Third Aluminum Plant

Plans are being drawn for the third aluminum plant to be built and operated by the Reynolds Metals Co. The new plant will increase the company's aluminum production to 160 million pounds a year. It is expected to be located at Listerhill, Ala., where the Reynolds company already operates an aluminum plant producing 40 million pounds of virgin aluminum a year.

Contract to Studebaker

The War Department has placed orders totaling $74,338,783 for additional Wright aeronautical-type engines with the Studebaker Corp., South Bend, Ind.

New X-Ray for Ford

A new 400,000-volt X-ray machine has been installed at the Ford Motor Co.'s Rouge plant automotive laboratory to locate quickly possible flaws in heavy steel castings, which the rays from the new machine will penetrate to a depth of several inches in a few minutes.

Rubber Consumption Off

Domestic rubber manufacturers consumed 53,655 long tons of crude in September—3.1 per cent less than in August, but 2.3 per cent more than in the same month last year, according to the Rubber Mfrs. Assoc. Imports in the month declined 23.3 per cent to 81,743 tons, while stocks—including government reserves of 236,090 tons—rose 6.2 per cent to a total of 473,684 long tons.

Opens New Plant

The American Chemical Paint Co. has transferred the activities of its Tidewater Division, formerly situated at New Castle, Del., to its new plant at Ambler, Pa., thus centralizing all its operations.

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, M. W. Bourdon.

Truck operators receiving the Ministry of Transport permit to purchase new vehicles sometimes have no choice as to make or type, but must take what they can get. To meet this situation the National Conference of Express Carriers has introduced an exchange plan, whereby members may secure, as far as possible, the makes and types to which they are accustomed.

* * *

For the first time in the history of the British motor industry, repair shop employes have now been brought under an agreement between the trade unions and employers. This generally covers the terms and conditions of employment.

* * *

Workers in munitions plants and coal mines in some districts are being issued priority travel vouchers, to relieve them of the need for standing in long queues of passengers waiting for buses. In some instances seats or standing room are kept vacant for "priority passengers" when vehicles leave terminals and drivers are instructed to stop during black-outs at points where they are likely to be waiting.

* * *

In several provincial bus services regular passengers have been enrolled and badged as auxiliary conductors, in return for free travel. Lawyers, journalists and business men in many lines are among these volunteers; collecting fares, signaling the driver and calling out the stopping places.

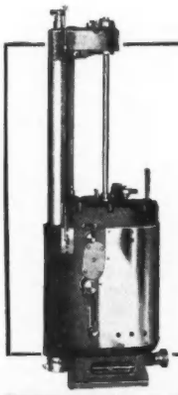
* * *

An amended regulation now permits passenger cars as well as trucks to use two headlamps with the official mask, which restricts illumination to 2.5 foot-candles at 10 feet. A better light is also legalized in the case of rear lamps showing red only, but side lamps must still be invisible at 300 yards.

Use of the additional masked headlamp is an option, but one of which few vehicle owners will be able to take immediate advantage, owing to the limited supply of masks. Accessory dealers are quoting up to three or four months delivery.

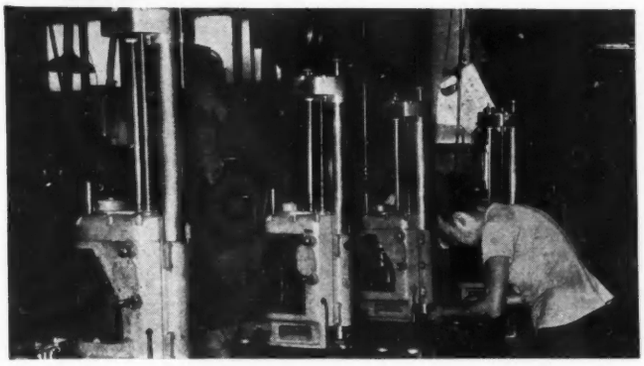
* * *

The death is reported of Percy Riley, designer of the Riley car, which is said to have been the first to have a four-speed gearbox with "silent third" driven through two pairs of helical gears. Also reported to have died recently were J. K. Starley, associated with Rover cars from their introduction in 1900.

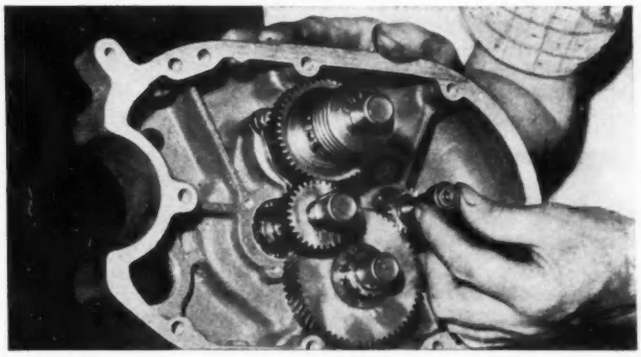


"30% DEEPER CUTS"

WITH COMPACT, ANTI-FRICTION TORRINGTON NEEDLE BEARINGS



1 CYLINDER REBORING MACHINES, such as these, do a precise, quick, thrifty job of rejuvenating automobile engines. The unusual accuracy and economy of this "Stormizing" equipment are achieved largely through the use of Torrington Needle Bearings, it is reported by engineers of Storm Manufacturing Co.



2 HERE'S THE INSIDE STORY. Six anti-friction Torrington Needle Bearings on the gear shafts occupy no more space than plain bushings, "yet," states Storm, "they permit the machines to make 30% deeper cuts. And they help assure the even flow of power to cutter required for high speed precision boring."

3 SMALL, AREN'T THEY, these Torrington Needle Bearings in the main frame! Compact Needle Bearings can be easily adapted in many instances to existing housings or designs. In this way, efficient and dependable anti-friction operation is obtained while keeping surrounding parts small in size and light in weight.

4 THE CROSS HEAD, TOO, operates efficiently on Torrington Needle Bearings. Their hardened steel construction and large capacity for storage of lubricant provide extra long service and eliminate the need for frequent attention. And, says Storm, "installation costs as well as initial bearing costs are very low."

Your product, too, may gain by the important advantages of the Torrington Needle Bearing: high radial load capacity; small size; lasting lubrication; quick installation, and interestingly low costs. Our Engineering Department will

be glad to give you full assistance. For more detailed information, write for Catalog No. 107. For Needle Bearings to be used in heavier service, write our associate, Bantam Bearings Corporation, South Bend, Indiana, for Booklet 104X.

THE TORRINGTON COMPANY, TORRINGTON, CONN., U. S. A. • ESTABLISHED 1866

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit Cleveland Chicago Los Angeles London, England

TORRINGTON NEEDLE BEARING

MEN . . . . . .

T. C. Voleman has been elected vice-president in charge of sales for Northrup Aircraft, Inc., while **Graham L. Sterling, Jr.,** Los Angeles attorney, has been elected a member of the board of directors.

A. P. Fontaine has been named chief engineer of the Engineering and Development Department of Vultee Aircraft, Inc., succeeding **E. G. Bruce** who became the company's chief research engineer. Mr. Fontaine was formerly chief engineer of Vultee's Wayne, Mich., plant.

D. Robert Yarnall, mechanical engineer of Philadelphia, Pa., has been selected as the fifth recipient of the Hoover Medal, which will be presented during the Annual Meeting of The American Society of Mechanical Engineers in New York, December 1-5, 1941.

Charles H. Armstrong has been appointed by The Clark Controller Co., Cleveland, as assistant district manager of the Michigan sales territory.

Harlan A. Messner has been appointed sales engineer by Ohio Crankshaft Co., Cleveland, with headquarters in Los Angeles, Calif.

Chain Belt Co. has appointed **A. W. Thomas** as sales manager of the Construction Machinery Division, **D. A. Kalton** as assistant sales manager and **A. J. Frank** as assistant to the manager of the Division.

Edwin Mott, manager of the tires, batteries and accessories department of Esso Marketers, has been elected vice-president and director of Esso, Inc., taking the posts vacated by **J. Walter Saybolt,** retired.

H. F. Robertson has been appointed district manager of the New England office and warehouse of Jessop Steel Co., succeeding the late Hugh A. Scallen. Other changes in the sales organization are: **J. W. Stranahan,** formerly Cleveland representative, transferred to the Philadelphia office; **Paul R. Wendt,** formerly Cleveland representative, now at the Toronto office; **H. Preston Berry,** transferred from the Washington, Pa., plant to do special sales work for the Chicago office.

Charles J. Schwab has been appointed Detroit regional manager of the fleet sales division, Fargo Motor Corp. Mr. Schwab was formerly Fargo regional manager at Pittsburgh.

Harry L. Bill was elected vice-president and general manager of Greenfield Tap and Die Corp., succeeding **Howard M. Hubbard,** recently resigned. Mr. Bill resigned as president and general manager of United Aircraft Products, Inc.

Studebaker Export Corp. has appointed **Romain Knockaert** manager for the east coast of South America. Mr. Knockaert was connected for years with Studebaker's European headquarters in Brussels.

Col. Herbert W. Alden, director of engineering of Timken-Detroit Axle Co., was awarded the Col. Frank A. Scott Gold Medal for Meritorious Service to Industrial Preparedness by the Army Ordnance Association, for his service as chairman of the ordnance automotive advisory committee.

Joseph F. McCarthy, controller and secretary of the United Aircraft Corp., has resigned the latter duties to concentrate on the position of chief accounting officer. **Charles H. Chatfield,** an executive assistant, has been elected secretary.

Charles T. Fisher, president of Fisher & Co., a founder of Fisher Body Corp. and a vice-president of General Motors until his retirement in 1934, has been elected a director of Continental Illinois National Bank and Trust Co., Chicago.

Paul S. Strecker, personnel director of Grand Rapids Stamping Division of General Motors Corp., has been elected general chairman of the automotive section of the National Safety Council.

Walter E. Hawkinson, treasurer of Allis-Chalmers Mfg. Co., has been elected to the joint position of secretary-treasurer, assuming the secretarial duties of William A. Thompson, who resigned recently.

Reginald B. Taylor, formerly vice-president of Niagara Share Corp., has been appointed vice-president and assistant treasurer of Sterling Engine Co. Mr. Taylor will head the newly created priorities division of Sterling.

R. A. DeVlieg, formerly general works manager, has been elected vice-president of Nash-Kelvinator Corp. in charge of all Wisconsin operations. **N. E. Wahlberg,** vice-president, will head a newly formed engineering research division. **Meade F. Moore,** formerly chief engineer of the Nash Motors Division, will become chief research engineer of the new division, while **Floyd Kishline,** of the engineering department will become chief engineer.

John J. Batterman has resigned as president and general manager of Gabriel Co. but has been elected chairman of the board of directors and will also serve as advisory counsel. **John J. Briggs,** executive vice-president, will become president and general manager.

E. C. Sparling has been appointed chief engineer of Sperry Gyroscope Co. and **M. L. Patterson** has been named general sales manager.

Marshal P. Madison, San Francisco attorney, has been elected a director of National Automotive Fibres, Inc.

Charles R. Stevenson, of Stevenson, Jordan & Harrison, Inc., management engineers, has been elected a director of Liberty Aircraft Products, Inc.

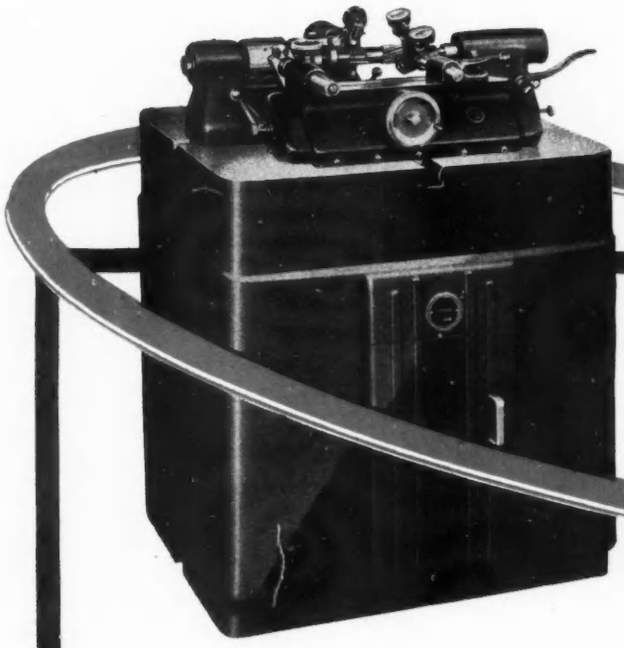
Guy Gundaker, Jr., formerly manager of the auto and home supplies department, has been named manager of the store administration department of B. F. Goodrich Co. **Frank R. Stanford** has been appointed operations manager of the store administration department.

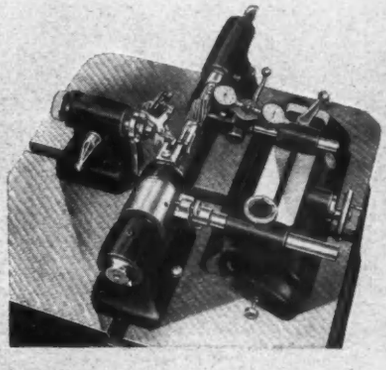
(*Turn to page 56, please*)

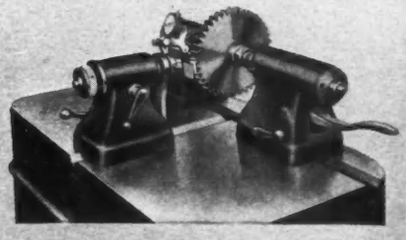
Speed Up GEAR CHECKING WITH

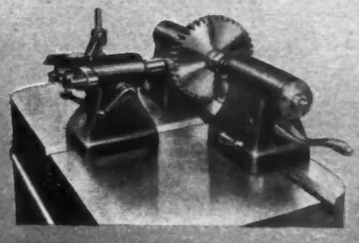
RED RING
UNIVERSAL
GEAR TESTER

RED RING
HELICAL GEAR
LEAD COMPARATOR









Red Ring Universal Gear Testers will check index, interference, helix angle, wobble, eccentricity and tooth size of the ordinary small gear in less than a minute, making it useful for production inspection.

Operation is simple, easy—requires no extraordinary skill. Readings are to .0001".

The Red Ring Helical Gear Lead Comparator compares the lead of each tooth to that of a precision master gear, or to a master disc. Set up is simple and easy, and once the job is set up almost any workman of average skill can make the inspections.

Gears integral with the shaft—arbor mounted gears—or internal gears may be checked.

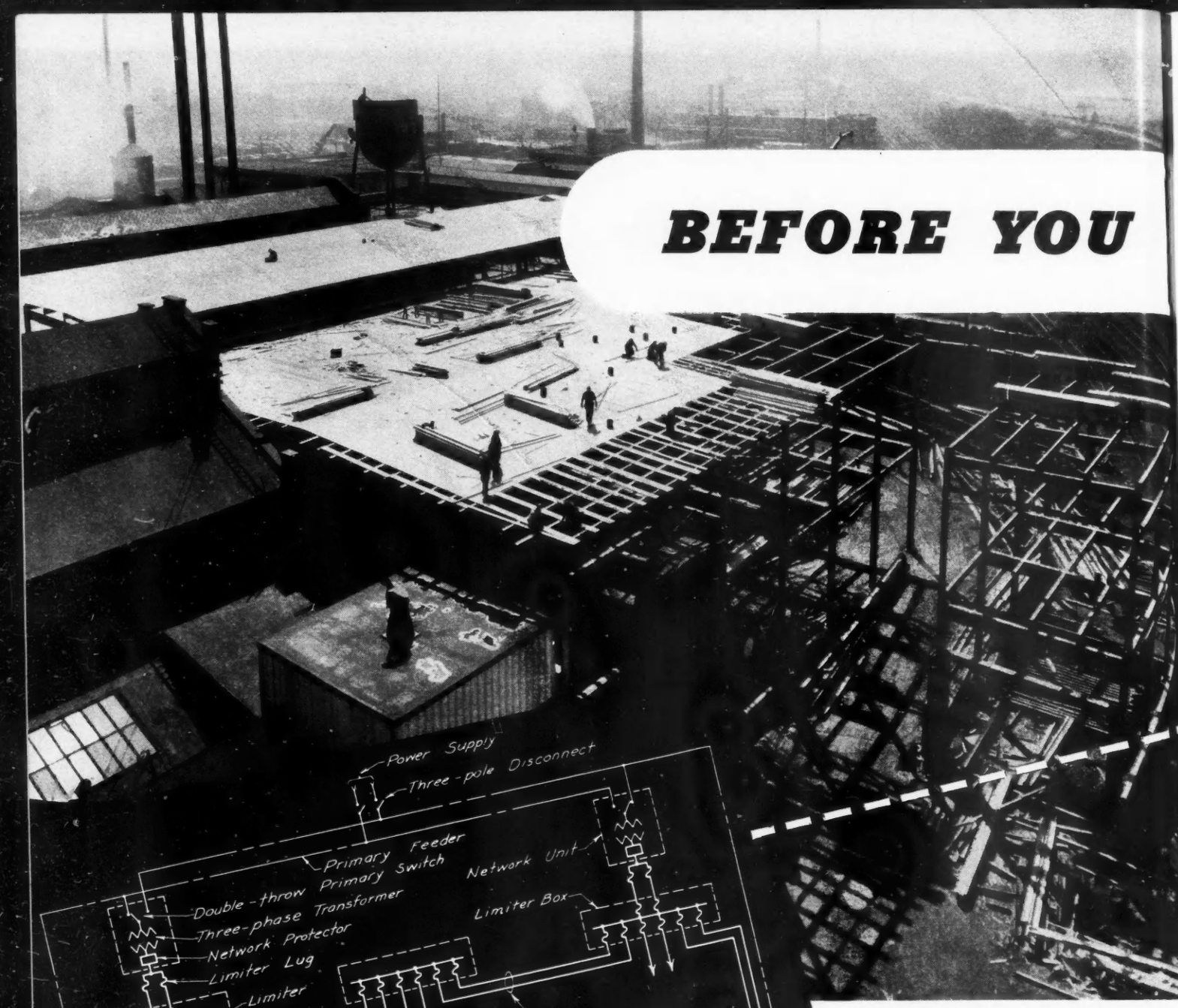
Both gear testing machines are extremely sturdy, high precision instruments. They will make a large reduction in gear inspection time and cost.

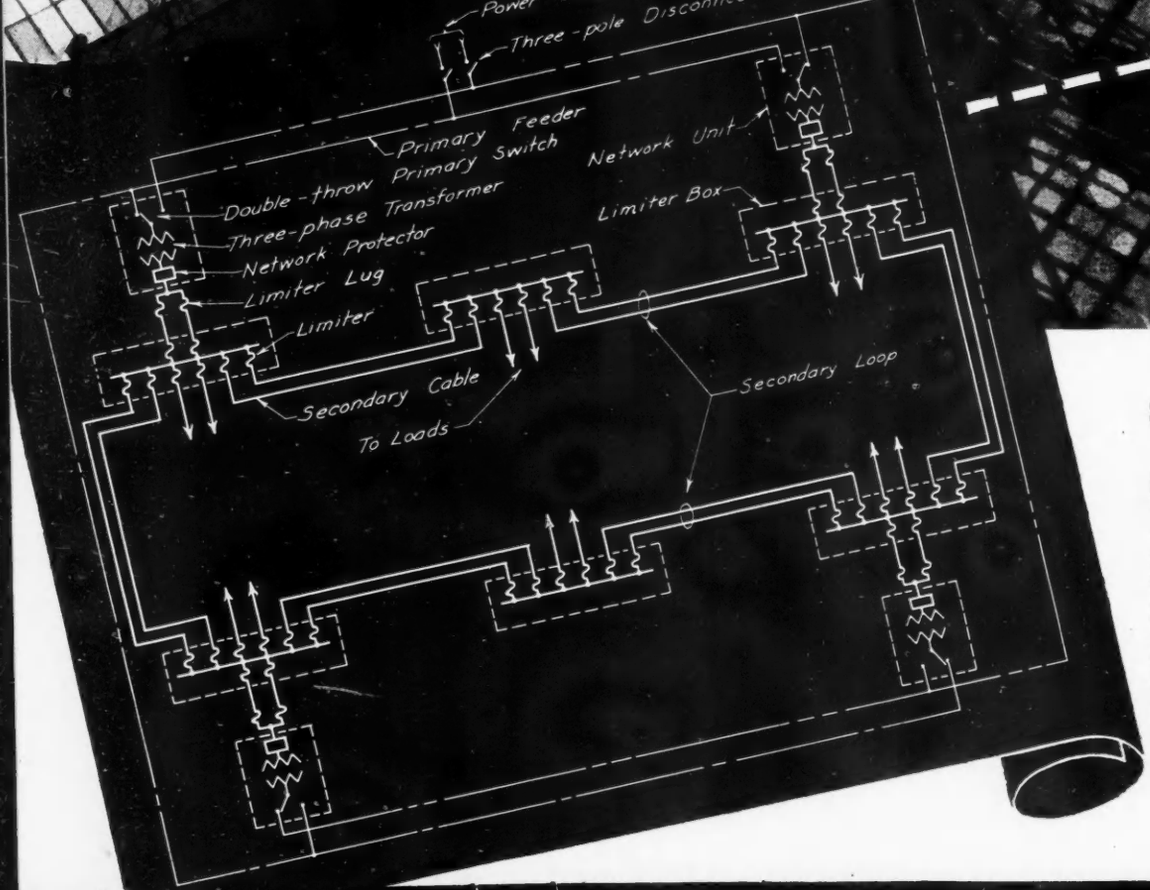
Write for data on these and other Red Ring Machines.

NATIONAL BROACH AND MACHINE CO.

5600 ST JEAN • DETROIT, MICHIGAN

BEFORE YOU





WITH THE NETWORK SYSTEM FAULTY FEEDERS ARE AUTOMATICALLY DISCONNECTED WITHOUT INTERRUPTING SERVICE

By using a double-throw primary switch with each transformer and arranging the primary feeders so that any transformer can be connected to either feeder, spare transformer capacity is held at a minimum. Half of the transformer capacity is normally connected to each feeder. When a transformer or feeder fault occurs, the faulty section is automatically disconnected without interrupting service.

WESTINGHOUSE

Westinghouse

BUILD INVESTIGATE

THESE ADVANTAGES OF THE WESTINGHOUSE PLANT NETWORK SYSTEM

- **Permits load rearrangement or expansion at minimum cost.**
- **Minimizes service interruptions and production delays.**
- **Provides greater protection against sabotage.**
- **Gives better voltage regulation throughout plant.**
- **Cost is comparable to that of other distribution systems now in general use.**

No manufacturer increasing production capacity can afford to overlook the advantages offered by the Westinghouse network system of power distribution.

Under the present conventional radial system employed in most plants, a failure on any main feeder cable results in power interruption to an entire distribution bus. Also, in rearranging machines to facilitate production, one feeder is often overloaded while another is underloaded.

The network system of distribution completely eliminates these difficulties—failure in any primary or secondary cable is automatically isolated without interruption in the power supply. This makes it impossible for a saboteur to cause sufficient damage to the system to shut down the plant and prevents lost production time through accidental faults.

Also, when additional load is added, instead of major revisions in the system, including new transformer banks, the network system can be extended almost indefinitely by simply adding network units. Equally important is the fact that voltage regulation on the entire network will be approximately the same at all points in the system.

This method of power distribution not only serves a new plant's present needs more efficiently but provides complete flexibility for the future at a cost that compares favorably with other systems. Before you build, it will pay you to get complete details on how this method can be used to safeguard production. Write today for folder B-3001.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.

J-94426-A

Time Saver for American Industry

(*Continued from page* 52)

Layne & Bowler Expands

An 8800 sq. ft. addition to the plant of Layne & Bowler, Inc., of Tennessee, has just been completed. The company has taken on additional government contracts for installing water wells.

Blooming Mill for ALCOA

The new blooming mill at Massena, N. Y., being constructed for the Aluminum Co. of America will cost in excess of $15 million. The mill will supply stock for manufacturer of forgings for airplane parts.

IHC Taps New Furnace

A new 150-ton open hearth furnace has just been tapped, 45 days ahead of schedule, at the Wisconsin Steel Works of the International Harvester Co. Completion of a second hearth will add a total of 160,000 tons of steel annually to the capacity of the Chicago steel district.

MEWA Appoints Peters

John E. Peters has been appointed Washington representative of the Motor and Equipment Wholesalers Assoc.

Light Truck Production Limit for 5-Month Period

Depending upon the availability of scarce materials, about 109,000 light trucks for civilian use may be produced during the five-month period ending Dec. 31, under a recent OPM order. This figure represents a reduction of 14 per cent below the same period last year, when approximately 27,000 light trucks—those less than 1½ tons—were produced.

SAE Aircraft Meet Held on Coast

Shedding new light on some of the pressing problems now facing the aircraft engineer, papers and discussions presented at the National Aircraft Production meeting of the Society of Automotive Enginers, at Los Angeles, Oct. 30-Nov. 1, included: Standardization; The duPont Exploding Rivet (AUTOMOTIVE INDUSTRIES, July 15, 1941); Morale in the Production Effort; Quality Control; Engineering Liaison and Production Control.

"Friends" Gets Cup Award

The Direct Mail Advertising Assoc.'s consumer magazine cup was awarded to "Friends," the Chevrolet owner magazine published by Motor City Publishing Co., Detroit.

Ruby Company Expands

The Ruby Chemical Co. of Columbus, Ohio, has completed a substantial outlay for new equipment, doubling its present plant capacity to meet a fast-growing demand for its soldering flux as more sheet metal products are called for by the government and industrial concerns.

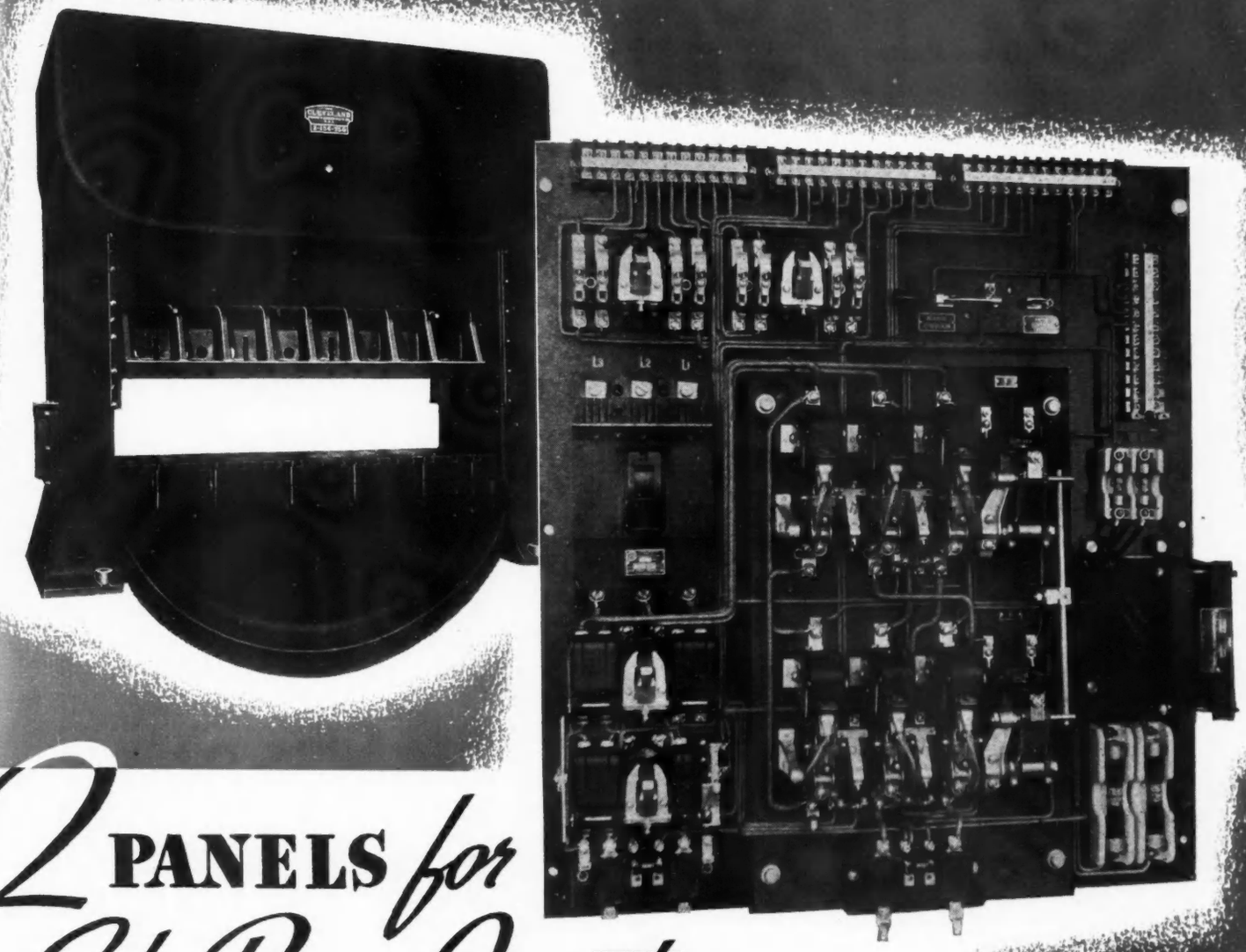
Brightwork in Stock to Be Scrapped After Dec. 15

Although some automobile manufacturers have sufficient brightwork already milled, cut and in stock for production several months beyond the deadline, this stock will be relegated to scrap under the OPM order of Oct. 26 banning the use of brightwork containing copper, nickel, aluminum or chrome after Dec. 15. This predicament presents itself despite the fact that the official order states that, effective immediately, no producer shall produce brightwork except in amounts necessary to complete production schedules up to the deadline.

A number of companies have been experimenting with paint and plastic substitutes in anticipation of the ban. Suggested substitutions include painted steel strips for trim, painted grilles, plastic trim to match body colors, clear varnish polished to a high luster etc.

The brightwork ban is expected to have a disastrous effect on 30 to 40 Michigan and Ohio plants that do plating work for the automobile industry.

(*Turn to page* 58, *please*)



2 PANELS for Safe Press Operation

● These two compact panels replace as many as nine separate pieces of apparatus, thus cutting space requirements and installation costs—sometimes as much as 50%.

The Air-Clutch Brake Control, Main Motor Starter, and slide or bed adjustment motor starter, with full motor protection and short circuit protection by breaker or fuses are mounted in one cabinet.

The compact master panel includes cycle selector switch, "INCH" and "STOP" Buttons, and Motor Starter Push Buttons. Cylinder Locks to prevent unauthorized operation of motor starter buttons, are provided.

Compact, effective, space saving, and low cost installation "3C" Press Control Panels, giving operator safety, are operating on countless heavy duty presses.

Descriptive Bulletin available on request.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

CIO Refuses Parts

(*Continued from page* 48)

ilar methods to insure contracts in 14 small Ford Motor Co. village industry plants in southeastern Michigan employing 3516 workers is problematical pending an NLRB election. A Ford union official said he did not think the UAW-CIO members at the Rouge plant would take action against plants where the UAW-AFL has existing contracts.

Willys-Overland Motors, Inc., in Toledo became the second automobile manufacturer after Ford to sign a closed shop contract with the UAW-CIO. The contract signed October 16, but retroactive to September 11, covers 4000 employes and grants wage raises from 8 to 24 cents per hour, totaling $1,000,000. Officers workers will get a $4 weekly raise. A cash bonus of 2 cents per hour will be paid June 1 to workers not taking a one week vacation with pay. Union seniority and the dues checkoff also are included.

A 19-day strike of 1400 workers at Midland Steel Products Co., Cleveland, was ended October 18 after curtailing output at Hudson and Studebaker, which depend upon Midland for frames. James F. Dewey, Federal conciliator, arranged the settlement which provides for wage raises of 1 to 13 cents per hour and reclassification of 342 employes. The strike was called to protest a 20 per cent differential between Midland's Cleveland and Detroit plants. The Detroit plant was closed by a strike last spring.

BOOKS . . . .

HANDBOOK OF SLEEVE BEARINGS, *by Albert B. Willi, Chief Engineer, Federal-Mogul Corp., Detroit, Mich.*

Following many years of activity in promoting a better knowledge of engine bearings, Federal-Mogul Corp., Detroit, Mich., has published this comprehensive book, which is said to be the first of its kind. It has been designed as a complete reference manual for engineers, draftsmen, and designers.

It is divided into eleven sections covering bearing materials, interchangeable bearings, oil grooving, adjustment shims, etc. It discusses the effect of design, the selection of materials and production methods upon sleeve bearing efficiency, and defines the field of application for each basic type of sleeve bearing. Perhaps one of the most valuable features of the book is the portion devoted to tabular data, listing the types and sizes of bearings and bushings for which major items of manufacturing tools are available.

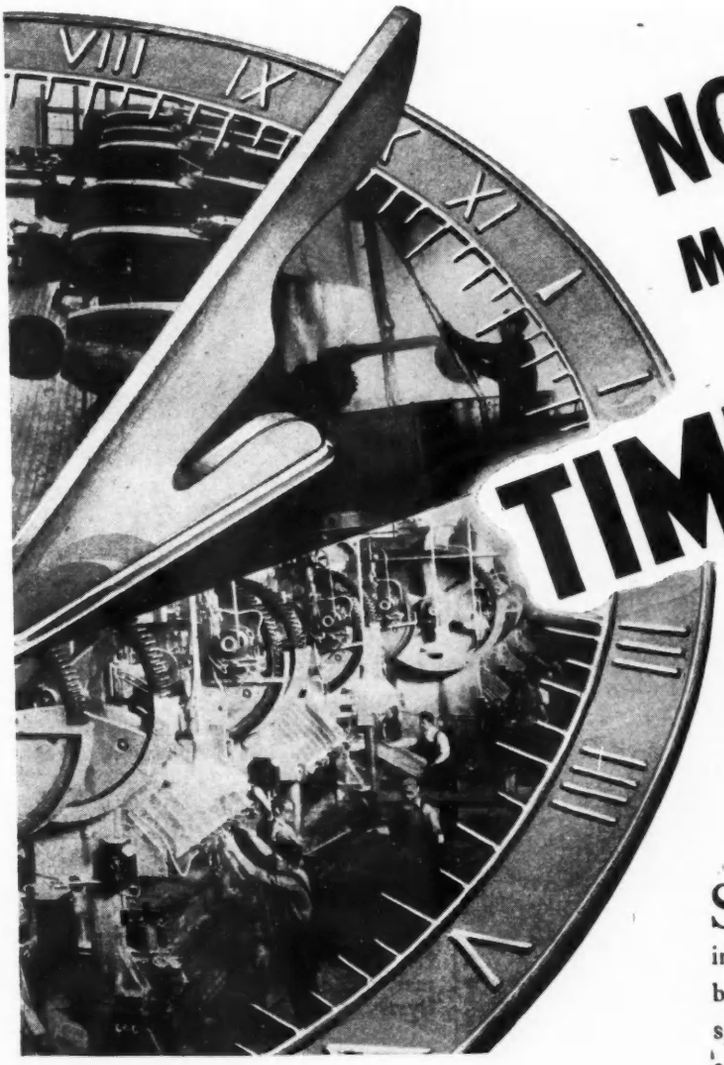
THE MARKETING OF USED AUTOMOBILES, *by Theodore H. Smith, Ph.D. Published by the Bureau of Business Research, The Ohio State University, Columbus, Ohio.*

This book traces the history of the used car market from its very beginning and gives much information also on the somewhat related subject of installment selling. Strangely enough, it appears that a used car was sold before the first sale of a new car was concluded. We are told that what was probably the first sale of a used car was the personal sale by Henry Ford of his gas buggy in 1896, to Charles Aimsley of Detroit, for $200, after it had been driven about 1000 miles. The first sale of a factory-new car is generally accepted to have been made by the Winton Motor Carriage Co. a year or two later.

NEW ENCYCLOPEDIA OF MACHINE SHOP PRACTICE, *edited by George W. Barnwell, professor of production practice at Stevens Institute of Technology. Published by Wm. H. Wise & Co., Inc., New York.*

The sudden increase in machine-shop activity due to the inauguration of the defense program has led to a shortage of skilled machine-shop labor. This has led to a resumption, or, rather, an expansion of training in machine-shop operations. Hand in hand with the practical training in the shops goes instruction in the principles of machine-shop practice, and this in turn has given rise to a demand for books on the subject for class-room use or for self-instruction.

The book under review evidently is intended chiefly for the use of young men wishing to enter upon a machinists' career. It has been contributed to by a number of authors, each presumably a specialist in the particular branch of machine-shop work on which he writes, and the book is offered at a low price for its size and the amount of information contained, to make it accessible even to persons of very limited resources. The book, of course, is written mainly from the standpoint of the practical machinist rather than that of the designer, which, however, is not saying that it contains no information that might be useful to a designer.



NOW ... MORE THAN EVER TIME COUNTS

So . . . for full speed ahead on U. S. Defense Orders, enlist the help of trained Oakite Service Men to smooth out all "traffic jams" from your CLEANING OPERATIONS!

SINCE cleaning is a production operation of prime importance on practically every Defense Order placed by the Government, it must be performed with safety, speed, thoroughness and economy. That is why thousands of plants today specify

SAFE, FAST-WORKING OAKITE MATERIALS ... METHODS ... SERVICE

to assure a smoothly functioning production schedule . . . to make certain of safety to personnel and product . . . to keep unit costs low.

Let us help you . . . NOW . . . when time is so important. Remember, our Nation-Wide Staff of trained representatives is at your service, without cost or obligation . . . and their recommendations are backed by a binding GUARANTEE that protects your interests in every way! Won't you write us today?

ASK US ABOUT

Safely cleaning aluminum before anodizing or spot-welding

Cleaning brass, bronze, other copper alloys before bright nickel and chrome plating

Cleaning before zinc plating

Cleaning cold rolled and stainles steel

Removing carbon smut and insoluble dirt before cadmium plating

Eliminating water spots on plated articles

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OAKITE PRODUCTS, INC., 28A Thames Street, NEW YORK, N. Y.

Representatives in All Principal Cities of the U. S. and Canada

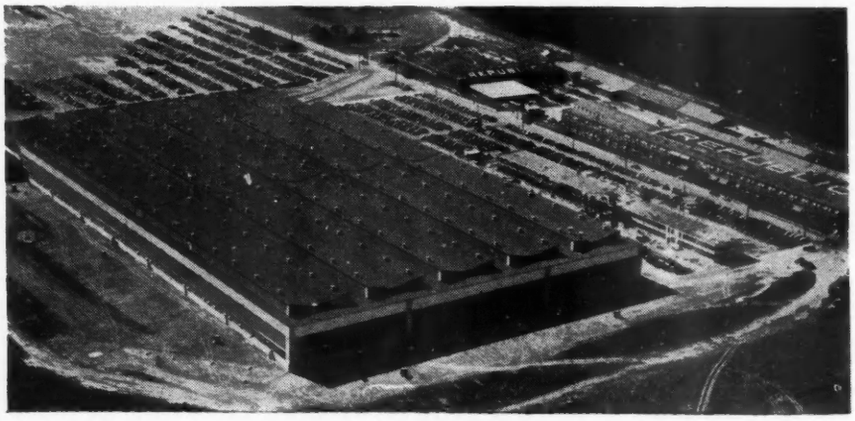
OAKITE MATERIALS...METHODS...SERVICE

Certified

CLEANING FOR EVERY CLEANING REQUIREMENT

"Thunderbolt" Factory

This air view is of Republic Aircraft Corp.'s newly completed production plant at Farmingdale, L. I., N. Y. Occupying an area of 500,000 sq. ft., the building will house the production lines for the Army P-43 "Lancer" and P-47 "Thunderbolt" pursuit planes. The latter has a 2000 hp. engine designed for high-altitude flying and is said to be the only U. S. Army pursuit with an engine of its size



OPM Extends Priority Orders A-1-c & d

Pending the promulgation of a new type of order by government priority experts, OPM has extended to the end of the year preference ratings A-1-c assigned to aircraft engine and propeller manufacturers, and A-1-d assigned to airframe manufacturers.

OPM has also issued an order granting an A-10 preference rating to dealers supplying any operator of registered and certificated aircraft.

Geschelin to Speak at SAE

"National Defense the No. 1 Job—How it Has Affected Passenger Car Design for 1942" will be the subject of a talk by Joseph Geschelin, Detroit Editor, AUTOMOTIVE INDUSTRIES, at a joint meeting of the Technology Club of Syracuse and Syracuse Section SAE, on Nov. 24. Principal feature of the presentation will be a discussion of how the restrictions on materials for civilian use have affected the manufacture of the new cars.

New Plant for Hycar

Hycar Chemical Co. is the new name, adopted for the Hydrocarbon Chemical & Rubber Co., jointly owned enterprise of the B. F. Goodrich Co. and the Phillips Petroleum Co. The new company will construct a synthetic plant at Louisville, Ky., under a lease agreement with the Defense Plant Corp., at a cost of $2,750,000.

Carbide Tool Line

A complete line of standard "stock" tools comprising six styles and 46 stock sizes has been announced by the Tungsten Carbide Tool Co. subsidiary of the Michigan Tool Co., Detroit. All styles and sizes in four grades are available for immediate shipment.

Creates Operating Co.

The Cold Metal Products Co. has been organized to take over the manufacturing operations formerly conducted by the Cold Metal Process Co. of Youngstown, Ohio. L. A. Beeghly is chairman of the board of Cold Metal Products and V. J. Lamb, president.

Today's armies roll on

RUBBER

PHOTO BY U. S. ARMY SIGNAL CORPS

Rubber keeps armies on the move!

Modern military maneuvers call for speed, speed and more speed! And therein lies the strategical importance of rubber. For without rubber tires, rubber self-sealing tire tubes, rubber tank treads, rubber hose, rubber insulated wires and cables, cellular rubber, sheet rubber, rubber shoes and soles and heels, troops, guns, tanks, armored cars, supply and munitions trucks would be hopelessly slow. In "all out" defense, rubber is indispensable!

PHOTO BY U. S. ARMY SIGNAL CORPS

Quality tires save rubber... vital to national defense!

Quality tires give longer mileage, use less crude rubber per mile.

Thus, the user of quality tires is conserving both his own and his country's resources.

Speed demons are these members of the army's swift, far-ranging motorcycle patrols, whose iron steeds are equipped with tough, long-wearing rubber tires. Modern version of old-time cavalry, these mechanized units with their tremendous speed and fire-power are capable of lightning raids over great distances.

It's the knobs built into U. S. Rubber tires, developed originally for farm use in mud and snow, that make certain these mobile anti-aircraft guns will go where they're most needed, despite terrain or weather.

PHOTO BY U. S. ARMY SIGNAL CORPS

UNITED STATES RUBBER COMPANY

6600 East Jefferson Avenue, Detroit, Michigan

MEN and MACHINES

(*Continued from page 45*)

bore, which was brought out early in the present year. Development work on the smaller size just announced was carried out in February.

A LINE of refrigerating units for welding machines has been developed by the Progressive Welder Company, of Detroit, with a view to increasing the productivity of resistance welding equipment especially on aluminum and stainless steel aircraft assemblies. The units are applicable to welding equipment of various makes.

Refrigeration is applied to spot welding for the primary purpose of keeping the welding points cool. It is said to make possible continuous welding of four to ten times as many spots without requiring point dressing. Ten-minute continuous runs at 100 welds per minute without point dressing, are claimed to be not unusual for the combination of a Progressive three-phase aluminum welder and the new refrigerating unit.

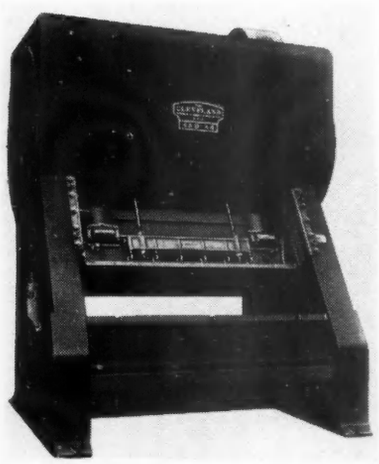
Hammond grinder designed for carbide tools

COMBINED facilities for straight wheel peripheral and cup wheel face grinding of carbide tools are provided in the design of the new 10-inch tool grinder manufactured by Hammond Machinery Builders, Inc., Kalamazoo, Mich.

It is designed with work tables which tilt to 25 deg., slide easily to any point of adjustment on machined ways, locking in position. The tables are slotted to accommodate the protractor angle-guide, furnished with the machine, and grooved to keep the working surface free from grit. The right-hand table is mounted on a heavy supporting shaft directly over a casting which serves as a sludge pan; a reservoir can be mounted over the guard for wet grinding. The over-sized arbor is mounted on four, pre-loaded precision ball bearings. On standard models the spindle is driven at 2100 r.p.m., by adjustable V-belts from a 1-hp. motor.

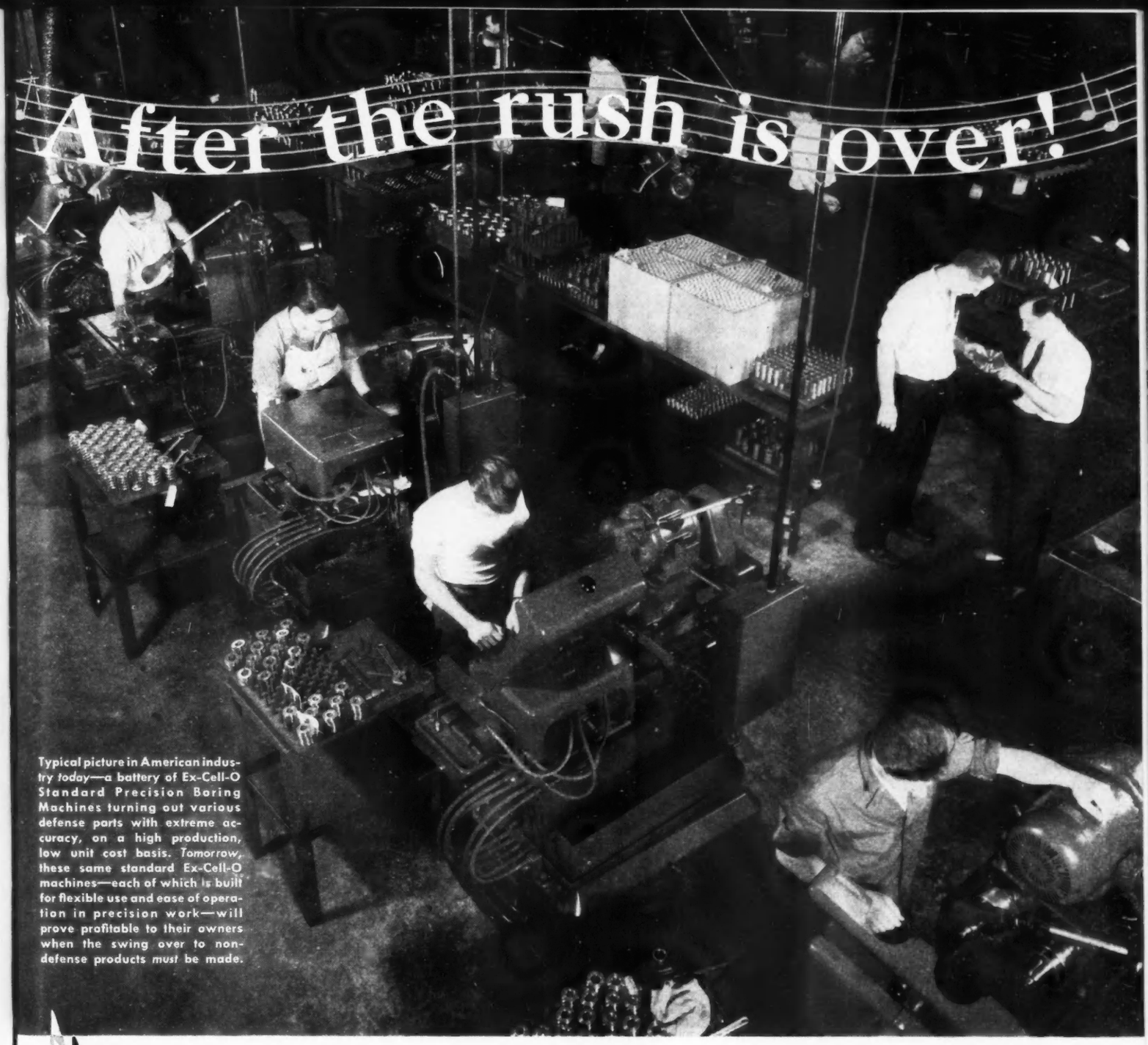
GRAVITY discharge of finished plieces into tote boxes placed at the rear of the machine, is one of the features of the newest offering of The Cleveland Punch & Shear Works Co., Cleveland, Ohio. This type of work delivery is effected by setting the press at a permanent incline of 30 deg.

The press is a straight sided double



Cleveland power press inclined at 30 deg. discharges by gravity

After the rush is over!



Typical picture in American industry *today*—a battery of Ex-Cell-O Standard Precision Boring Machines turning out various defense parts with extreme accuracy, on a high production, low unit cost basis. *Tomorrow*, these same standard Ex-Cell-O machines—each of which is built for flexible use and ease of operation in precision work—will prove profitable to their owners when the swing over to non-defense products *must* be made.

Sweet music to the ears of today's buyers of Ex-Cell-O precision machines will be the steady sound of those same machines in operation *tomorrow* . . . when world peace will bring a definite advantage to manufacturers in this country whose present equipment can be adapted to civilian needs, quickly and profitably, and still meet the new high standard of speed and accuracy in production.

Every standard Ex-Cell-O machine—for boring, for grinding threads, for other precision machining—is designed and built to do most efficiently and at low cost the extremely accurate job demanded today for defense . . . to meet these same exacting requirements that will unquestionably be essential tomorrow if profits in competitive markets are to be assured.

Wherever an Ex-Cell-O precision machine is installed today, one of the most important steps in the planning for the inevitable tomorrow is already taken.

EX-CELL-O CORPORATION • DETROIT, MICHIGAN

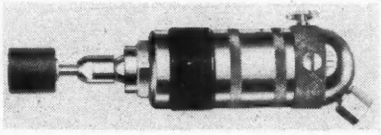
XLO

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

crank machine of four piece tie rod construction, single geared, equipped with electrically controlled hydraulically operated friction clutch and brake. It is arranged with an automatic single-roll feed, hydraulically operated, taking material 13/32 thick and up to 2½ inches wide, right to left across the dies. The design incorporates a box type crown, which avoids overhanging gears and other projections. All gears run in an oil bath, and the slide—which may be spring or air counterbalanced—is arranged for hand adjustment. The slide has a 3 inch stroke, 3½ inch adjustment, and operates at 45 strokes per minute. Press capacity is 150 tons.

EXTENSIVE work tests in aircraft and other industrial plants preceded the introduction of the ARO Model 22BGS Grinder, according to The Aro Equipment Corporation, Bryan, Ohio.

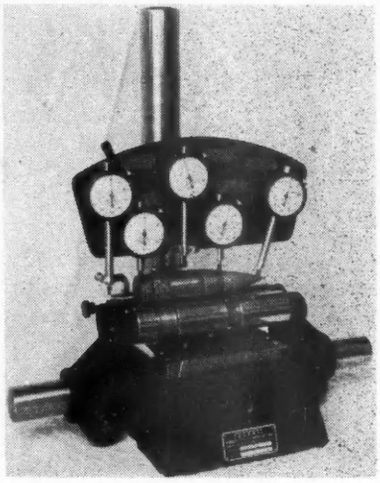
This pneumatic tool is only 6¼ inches in length over all, is compact and light enough for one-hand operation, yet rugged and powerful enough to drive wheels up to 2 inch diameter at speeds up to 17,000 r.p.m. It is equipped with large precision type ball bearings, and is available with either lever or button throttle and with spindle extension and collets of various sizes.



Aro pneumatic grinder is light enough for one hand operation

FOR checking .37 m/m anti-aircraft shells, Federal Products Corporation, Providence, R. I., has developed a multiple inspection gage designed to inspect the exterior at four points for diameter and concentricity and simultaneously inspect the concentricity of the fuse hole with respect to the O.D. Besides revealing whether dimensions meet the required limits, this instrument also indicates how far out imperfect pieces are, permitting maximum salvage for refinishing.

The gage is entirely mechanical, low in first cost and low in upkeep and interchangeability, according to the manufacturer. The shell rests on roller V blocks, which can be rotated to compensate for wear, and is positioned laterally by an adjustable stop screw. Gages of the same type are made for shells of any size.

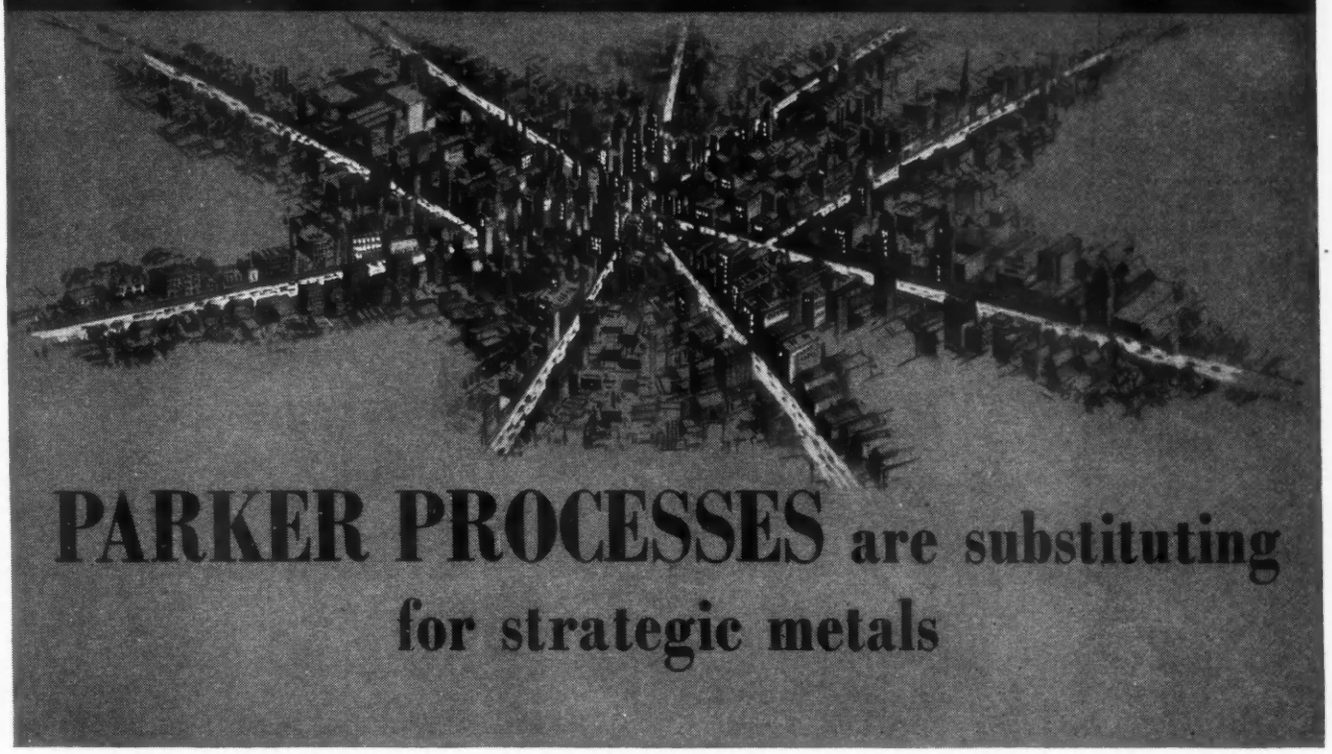


Federal Products Corp. multiple inspection gage

CAREFUL studies made by the Acme Steel Co., of Chicago, show unexpected shipping economies in connection with straight line production and assembling, through the use of the skid-load method of handling, in which parts for assembly are stacked on non-returnable pallets or racks and secured by flat steel bands. Frequent further savings are experienced at both ends of the line due to planned handling of the parts. The over-all advantage is accumulated in packing and unpacking time, cost of containers and in tare.

Clutches, packed three to a container, in one instance out of many, requires 2¼ hours for 13 cartons, whereas 40 units could be stacked—ready to be

THERE IS MORE THAN ONE ROAD TO MARKET



PARKER PROCESSES are substituting for strategic metals

There is always more than one way to do almost any job, and thousands of manufacturers are developing new methods—finding new materials—solving new problems. When defense requirements create difficult conditions in their finishing departments, they take a new road—it may be better—and shorter.

Parker Processes are taking the places of strategic metals. In scores of cases they are substituting for zinc, tin, cadmium and chromium. They provide ample protection and fine appearance—at comparable costs. If finishing for appearance, for rust-prevention, or reducing wear on friction parts, Parker Processes are proven "roads" to your destination.

If you have not investigated Parker Processes recently, send for new books fully describing them.

PARKER RUST PROOF COMPANY
2178 E. Milwaukee Ave. • Detroit, Michigan

PARKERIZING
A finish and substantial protection from rust on bolts, screws and small mechanical parts.

BONDERIZING
A rust inhibiting paint base that bonds the finish to sheet metal surfaces.

PARCO LUBRIZING
A chemically produced coating for friction surfaces that retains oil and prevents metal to metal contact.

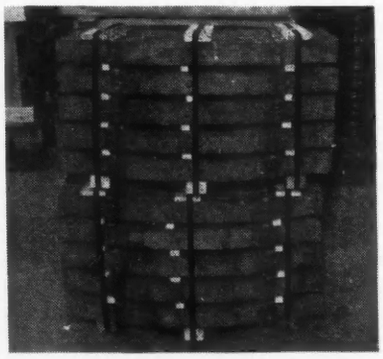
PARKER *Processes* CONQUER RUST
BONDERIZING · PARKERIZING · PARCO LUBRIZING

picked up at the assembly line—and strapped on a pallet in 45 minutes. When two steel bands had been snipped, they were unpacked!

Loading mufflers on one-trip pallets saved return freight on a set of 150-pound dollies, reduced handling of individual packages, saved warehouse space for shipper and receiver.

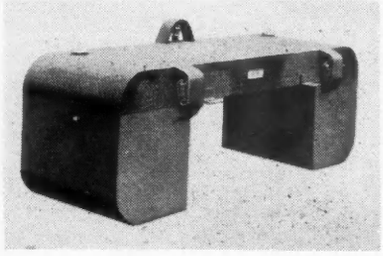
Truck springs, now stacked 56 to a skid-load, are now handled with far better economy than piece by piece, at the old rate of 100 per manhour.

A direct saving of 81 per cent is claimed in strapping bulky truck axles in packages of four, instead of crating the brake drum housings of each axle and shipping them separately. Bumpers, treated by the same general method, required 25 per cent less storage space and cost 90 per cent less to pack. Several photographs from an interesting collection, tell the whole story.



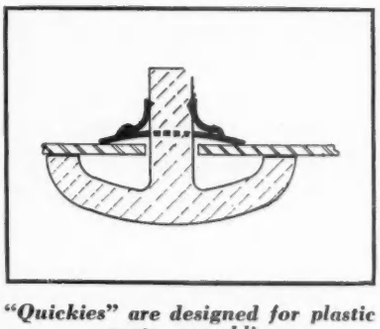
Fifty-six skid load of truck springs

A NEW and improved safety fuel tank of the saddle type has been developed by Mechanical Handling Systems, Inc., of Detroit. Features designed to insure safe, efficient, trouble-free operation, include: safety pressure valves for pressure and vacuum relief in normal operation; preventing flames from entering or the contents from spilling, even when the tank is upside down. Also fusible plugs to add venting capacity under fire conditions. Filter and sediment traps, placed outside the tank, but guarded by welded-on shields, are provided for each carburetor line. Filler necks with locking, safety pressure caps are provided on each saddle. Filler spouts have theft-proof pockets. Furnished in four capacities, 75-125 gallons, the tanks are all-welded of pickled steel plate.



Saddle type tank of Mechanical Handling Systems has new features

SPRING nut fastenings for plastic parts, developed under the trade-mark "Quickies" are now being produced in volume for use with ¼, 3/16 and ⅛-inch studs. The Prestole Devices Division of the Detroit Harvester Co., in Toledo, Ohio, which recently developed these devices has found a gratifying reception for them. Their advantage is that, due to the direction of action of the spring in the nut, fastenings are held under permanent tension, regardless of expansion and contraction of adjoining parts, occasioned by temperature change.



"Quickies" are designed for plastic parts assemblies

CUTTING INTO THE MACHINE TOOL BACKLOG

QUICKLY...

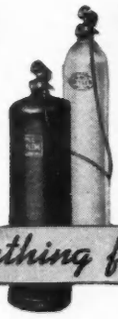
Photo courtesy Jones & Laughlin Steel Corp., Detroit

Four in the time of one — that's the speed with which these machine tool parts are being flame cut from 5/16-inch steel plate with an Airco Travograph Oxyacetylene Cutting Machine. This cutting operation involving 20 lineal inches requires only a little more than a minute. By using a 72 x 240-inch plate, waste motion is practically eliminated—waste material is kept at a minimum—and the 2,400 pieces of this design are quickly cut.

The balance of the order consists of some 14,900 additional tool parts involving three other designs. The usual "changeover" problem vanishes in fast time when the Airco machine gas cutting process is put to work. A duplicate steel cam or templet of each design is its only requirement. The templet guides the magnetic tracing device which in turn directs the motion of the torch.

Many shops are circumventing today's machine tool shortage with the aid of this versatile Airco cutting process. Visible evidence of the variety of shapes, sizes and thicknesses which can be accurately cut in steel is interestingly depicted in the new booklet "Airco Oxygraphs and Travographs". A request on your company letterhead will bring a copy promptly.

Air Reduction



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AIRCO DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO — WILSON

Anything and Everything for **GAS WELDING or CUTTING and ARC WELDING**

Unemployment Grows

(*Continued from page* 19)

for the conversion to aircraft engine production, 3,600 workers were made temporarily idle. But more than 1,000 of these men already have been hired by Bell Aircraft and Curtiss-Wright and have proved better workers than new men hired off the street with no automotive background.

Packard now has nearly 6,000 men employed in its aircraft engine division, the majority of whom were transferred from automotive jobs. In the skilled groups, the transfer has involved virtually no problems. In the transfer of unskilled workers, some retraining is necessary, varying from a week to three or four months. depending upon the ability of the worker and the complexity of his new job. Chrysler, Briggs and Murray are conducting extensive training courses for workers shifting from automotive or body manufacture to airframe fabrication. The problem of working with aluminum and the care with which it must be handled compared to steel is the chief obstacle that must be overcome.

Six months ago the vocational schools of Detroit, Flint and other automotive centers were busily engaged in training high school graduates, youths from the NYA, men from the WPA and others for jobs in defense industry. An acute labor shortage appeared imminent and migrant labor flocked into Michigan and other midwest states seeking defense employment. Now the emphasis has changed. Virtually all the able workers among those trainees have been absorbed by defense industry. The automotive workers, who were busy on civilian production at record levels last spring are now engaged in Training Within Industry courses and similar classes to qualify for defense jobs. About 80 per cent of the current training courses are devoted to qualifying skilled and semi-skilled workers for defense positions or upgrading of other defense workers to make room for these transferred automotive employes.

The 32-hour week is another remedy to spread employment among the gradually dwindling number of workers engaged in automobile production. As an example, the Ford Motor Co. had more than 90,000 workers on its Michigan automotive payrolls last spring. This will drop nearly 50 per cent to an estimated 46,600 men in December when the more drastic curtailment program for passenger car production goes into effect. Instead of building 79,300 cars, as it did in December, 1940, Ford will be permitted to build 38,000 passenger cars this December if materials are available.

But the Ford contract, like most automotive contracts with the UAW-CIO, contains a clause that when production drops to a level where men with seniority (usually six months' employment) must be laid off, the work week is curtailed from 40 to 32 hr. This serves to spread the available work and reduce unemployment, although, of course, it also cuts weekly earnings.

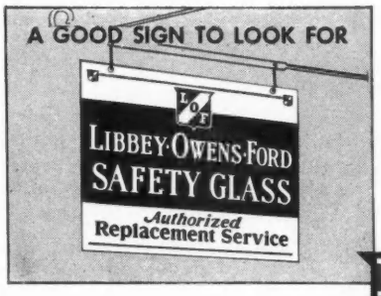
According to a survey by the Michigan Unemployment Compensation commission of five automobile manufacturing plants and 23 producers of bodies, parts and equipment in the Metropolitan Detroit area, a total of 33,171 more non-defense workers could be employed on Nov. 30, 1941, by reducing to the 32-hr. week than could be employed on a 40-hr. basis. These 28 automotive plants expected to employ 146,883 men on non-defense work on Nov. 30 and 126,529 on similar jobs on Jan. 31, 1941, based on present OPM production quotas and granting a 40-hr. week. This number could be boosted to 179,054 on Nov. 30 and 153,083 on Jan. 31 by reverting to the 32-hr. week, thus effecting a 20 per cent gain in employment. Union officials are opposed to any reduction of the work week below 32 hr., preferring to have workers laid off to seek jobs elsewhere or go on unemployment relief rather than dilute the men's incomes by reducing to a 30 or 24-hr. week.

"IT DOESN'T DO TRICKS WITH YOUR VISION"

● "L·O·F Hi-Test Safety PLATE makes driving safer and more enjoyable, by reducing eyestrain and fatigue."

Libbey·Owens·Ford Hi-Test Safety PLATE is two lights of plate glass, ground and highly polished to provide maximum freedom from distortion as you look through it. These are bonded together by a strong, tough, transparent plastic to give maximum safety.

The familiar L·O·F trademark, "The Mark of Quality," tells the world that you are using the finest of materials in the building of your cars.



L O F **LIBBEY·OWENS·FORD**
HI-TEST *Safety Plate* GLASS

Unemployment in Michigan that will be occasioned by the 48.3 per cent cut in December passenger car production is difficult to estimate, although Gov. Murray D. VanWagoner has said it will total 90,000 to 100,000 workers by January. The Governor also believes it will require about a year to take up the unemployment slack due to the progressively larger cuts in passenger car production now scheduled by OPM.

Reports submitted by the five major automobile manufacturers in Michigan to the House Committee Investigating National Defense Migration, headed by Representative John Tolan (Dem.) of California, provide the most tangible evidence as to the probable trend of employment under the curtailment program. These five companies, General Motors, Ford, Chrysler, Hudson and Packard, employed 320,472 workers in Michigan plants last June 30, 1941, when automobile production was near its peak. Of this number, 289,136 were engaged in non-defense production, while only 10 per cent, or 31,336, were on defense jobs.

These reports were submitted in mid-September, at which time the companies estimated total employment on Oct. 31, 1941, would be 306,028. Non-defense employment has dropped to 248,106 workers, while defense employment has climbed to 57,922, not enough to take up the slack created by curtailment. This leaves net unemployment of 14,444 men compared to the June totals. Defense employment has risen to 19 per cent of the total.

With the 48.3 per cent curtailment in passenger car production taking effect in December, the five companies estimated total employment on Dec. 31, 1941, as 247,146 jobs. Of this number the non-defense group will have dropped to 71 per cent of the total, or 175,182 workers, compared to 71,964, or 29 per cent, engaged in defense. Projecting prospective employment into 1942 is rather uncertain due to the possibility of altering automobile production quotas or of stepping up defense output. But an estimate by the companies in their reports places non-defense production at 158,997 workers on March 31, 1942, while 34 per cent, or 82,800 will be on defense. This leaves net unemployment at 78,678 men.

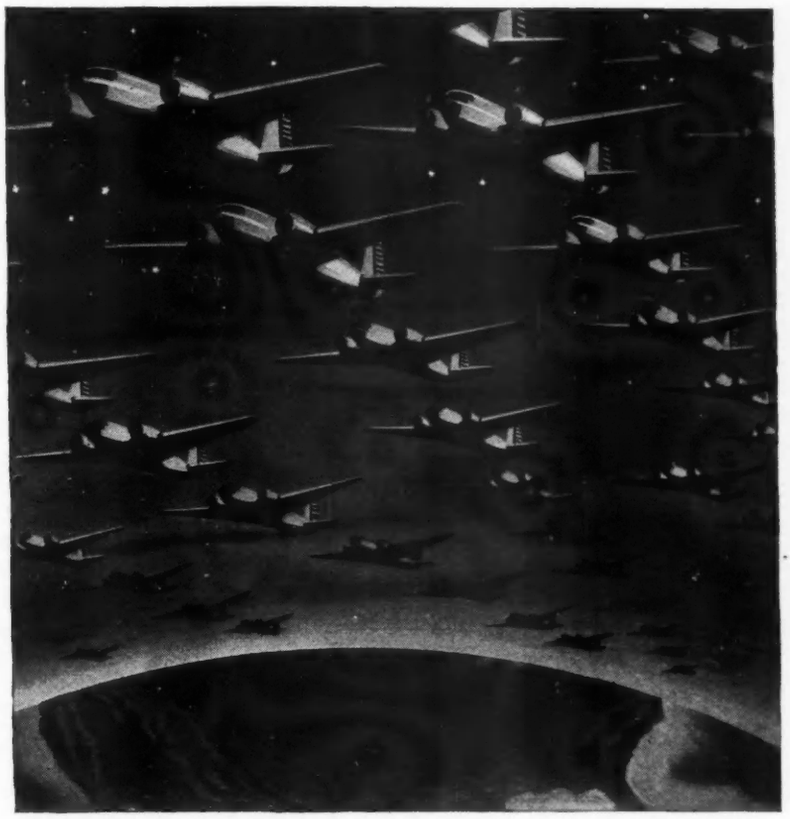
If defense employment can be taken as a gage of industrial capacity, these reports by the automotive companies show a steadily increasing diversion of their facilities to defense production. As of Oct. 31, 19 per cent of their employment is engaged in defense work. Leon Henderson, director of the civilian supply division of OPM, said recently that only 12 to 14 per cent of the country's productive capacity was engaged in military production, so it appears that the automotive industry is above the average. The OPM is striving for 25 per cent on defense by Jan. 1, which compares with 29 per cent that will be devoted to defense on that date on the basis of the estimates of employment by five automobile companies.

The table reveals that some companies are slower than others getting into defense production. This is due to the nature of their defense assignments. Ford's aircraft engine plant will not reach peak production until late next spring, while the bomber plant now under construction will not be completed until the summer of 1942. Hudson's Naval Ordnance Arsenal will not swing into real production until spring. Several GM defense plants also will be slow to reach full production due to lengthy tooling processes.

With some of these defense plants not getting into actual production before the summer of 1942 and the Ford and General Motors tank projects still in the early blueprint stage, it appears that the labor dislocation will not be remedied before September, 1942. However, there are so many factors entering into the situation—materials, rate of defense tooling and extent of automobile curtailment, to say nothing of the effect which Germany's Panzer divisions overrunning Europe may have upon the U. S. economy—that it is rather futile to say more than unemployment is with us in the midst of productive plenty and we must do our utmost to solve the problems it creates.

When You Have To Plan

. . . *plan high!*



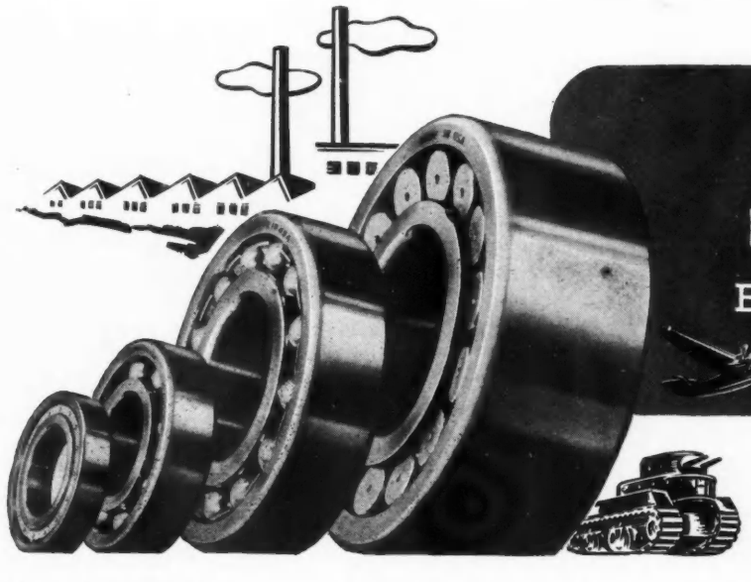
Who knows how many tanks, ships, planes, guns it is going to take to do the job ahead?

With our safety in the balance, more than we need is not too many. With our security at stake we must plan *high.* We must drown the threat to Democracy in a tidal wave of weapons. Democracy victorious, can be trusted to re-shape the surplus into instruments of peace.

SKF's people and plants are saying all this with bearings, and yet more bearings; by licking friction they lend speed both to the weapons of defense and the machines that turn the weapons out.

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA.

4777-r



SKF

BALL AND ROLLER BEARINGS

Eaton Expanding Its Plants

(*Continued from page 29*)

In an operation in which metallurgy plays such an important part, it is not surprising to find that Eaton has installed some new heat treating equipment supplied by The Electric Furnace Co. One of these is a gas-fired radiant tube, special atmosphere pusher type heating furnace specially designed for normalizing and scale-free heating for hardening, oil quenching, washing of propeller shafts, propeller shaft sleeves, and similar parts at temperatures ranging from 1475 deg. Fahr., to 1600 deg. Fahr. The equipment has capacity for heating to a temperature of 1550 deg. Fahr. a total of 1064 gross lb. per hr.

The equipment consists of a radiant tube gas-fired heating chamber, through which the material is automatically pushed on trays; an automatic ejector mechanism for ejecting the heated trays from the discharge end of the heating chamber; an automatic quenching equipment for oil quenching the parts, together with an automatic elevator apparatus, washing and rinsing equipment through which the trays are automatically conveyed from the quench. A special atmosphere generating equipment also is provided for producing the special protective atmosphere.

When utilized for heating for hardening, the equipment is entirely automatic in operation with the exception of pushing the trays into the charging vestibule in front of the pusher head at the charging end of the furnace. All other operations take place in proper sequence automatically, and the scale-free, hardened, quenched, and clean material is automatically delivered at the discharge end of the cleaning unit on to a sloping gravity conveyor from which the material is unloaded.

The furnace is heated by means of the Electric Furnace Company's specially designed recuperative type radiant tube heaters located crosswise of the heating chamber both above and below the material being heated. These tubes are fired in staggered relation. The radiant tubes are divided into three separately and automatically controlled zones. The supply of fuel to each zone is automatically modulated or regulated in accordance with the heat requirements by means of proportioning control mechanism actuated by pryometer equipment.

Design and arrangement of the furnace is such as to make it possible to employ it for normalizing operations alone. For this cycle we have the following sequence of operations:

1. The automatic timer makes contact, and the furnace chamber side discharge door rises.
2. The cross ejector advances and moves the leading tray of material from within the furnace chamber out through the side discharge door.
3. The cross ejector retracts, and the side discharge door closes.
4. The charging door of the furnace equipment rises.
5. The charging pusher mechanism charges a tray into the furnace and advances all trays one position, thus delivering the last tray in line into position before the cross ejector.
6. The charging door of the furnace closes.

The tray return conveyor operates independently but in synchronization with the remainder of the equipment.

The complete unit, including charging vestibule, quenching and washing equipment and the return conveyor equipment, requires a space less than 40 feet in length by 20 feet in width.

Wilcox-Rich Div. (Battle Creek)

The Battle Creek (Mich.) plant is essentially a valve specialist, produces intake and exhaust valves for passenger car engines, heavy duty engines of all kinds, and for aircraft engines. The latter are made either plain or sodium-cooled depending upon the customer's requirements. In serving this widespread community of interest, Wilcox-Rich is faced with an amazing multiplicity of sizes and designs. At the present writing, a rough estimate places

the number of valves in current production at around 1500 different drawings with about 30 aircraft types.

This estimate gives some impression of the flexibility demanded of the manufacturing operation, the need for methods and equipment capable of quick changeover from one job to another without sacrifice in time or economy.

Under the impact of the national defense program, the organization has recently expanded its facilities by the addition of a new building, set apart exclusively for aircraft contracts. This has added 33,000 sq. ft. of floor space, making the overall floor space in the plant 183,180 sq. ft.

To the layman, at least, it is of interest to learn that valves are produced by a number of distinct methods depending upon the nature of their design. Some are drop forged, one type is extruded from a slug of alloy steel, some are of composite construction, while most of the aircraft valves are Stellite-faced. One type of sodium-cooled aircraft engine valve requires three different forging operations with machining operations in between.

Since this valve is quite typical of W-R sodium-cooled valve practice, let us run over the procedure briefly. The total of 125 operations start with a relatively short but large diameter drop forging of about the proportion of the diameter of the head. This forging first is drilled with a large diameter hole through the body and into the head. Then the cavity within the head is formed. This is done on a battery of South Bend lathes recently installed in the new building. Incidentally, this is the first real production use of South Bend equipment we have noted in the industry.

The part now is returned to the forge shop where the body is drawn down in diameter, increased in length. It goes back to the machine shop for additional drilling operations and some turning operations.

Then the valve returns to the forge shop for the third forging operation where the body is drawn down to a smaller diameter and increased to its full length. This is followed by finish turning operations and the drilling of a fine hole in the small end. The cavity is filled with sodium through this small hole, then the hole is closed by pressing-in a small plug.

We understand that this division was perhaps the first organization to use the new Landis automatic hydraulic grinders, boasts two large batteries of these machines.

Due to the diversity of valve designs and valve materials employed here, the matter of heat treatment is given close attention. Recent developments have made it necessary to provide new facilities for nitriding certain types of valves and for this purpose they have installed a new heat treating department equipped with the most modern furnaces.

What with the emphasis on quality in all manner of components for aircraft engines, quality control is an important and sizable activity in this plant. The inspection department is divided into two separate sections—one for commercial valves, the other for aircraft valves. On aircraft valves, there is a rough inspection procedure, checking 100 per cent before completing the final machine shop and grinding operations. Then there is a 100 per cent final inspection.

An interesting commentary on quality control is the use of the Magnaflux method for checking all aircraft valves. In addition, this department is provided with the Brush surface analyzer which is used for investigations of manufacturing operations in which the surface quality is definitely specified by the customer.

Wilcox-Rich Div. (Saginaw)

Of all the Wilcox-Rich plants in the Michigan area, the Saginaw operation unquestionably boasts the widest variety of product, places the greatest premium upon the ingenuity of the factory management in improvising special methods and equipment. So much of the activity is of special nature that the bulk of the production machinery consists either of specially

fitted standard machines or entirely special machines designed and built in the plant.

The standard product of this plant consists of valve seat inserts—plain and Stellite-faced, valve lifters and tappets of many types, and the well-known line of the Zero-Lash hydraulic valve lifters. In addition, they serve as sub-contractors to the aircraft engine builders, supplying ball and socket joints for valve gearing, special tappets, and flyweights for Pratt & Whitney engine crankshafts.

The multiplicity of operations on the flyweights can be followed by reference to the factory routing reproduced here. In addition to the equipment noted on the routing, the new department also has some Cincinnati grinders and Ex-Cell-O thread grinders. Too, there is a Magnaflux machine for checking the various aircraft engine parts.

Valve seats are made by various methods depending upon the size and design, certain of these being Stellite-faced in addition. Typical of the commercial product is the sequence of operations shown in the table on page 28.

In the foregoing, note particularly the use of the new Norton Hydrolap machine which produces a beautiful surface finish within exacting dimensional limits.

The hydraulic lifters involve many exacting operations consistent with the performance expected of this device. Due to space limitations we shall confine ourselves to the routing of one of the major elements, the body, which is reproduced in the table on page 24.

The pictorial section shows several views in the hydraulic lifter assembly and inspection department, notably the leak-down test in which each unit must pass specifications for a given time element under a standard weight. Another of the interesting spots is the bench for the selective fitting of centerless-ground plungers in the plunger bodies. It may be noted that the plungers are prepared for the assembly operation by passing them through a battery of two Cincinnati Centerless grinders, connected by a magazine conveyor feed.

Owing to the obvious impracticability of covering the entire Eaton organization in this brief survey, some of the gaps will be filled in by an excellent selection of illustrations touching the high spots of every plant in the set-up.

Automotive Council Incorporates

Charles C. Tapscott, president of the Automotive Advertisers Council, has just announced the incorporation of the Council under Missouri laws. The group, formed some little time ago, is composed of advertising and sales managers in the automotive parts, accessories, tool and equipment fields.

Auto Makers Get New Orders

(*Continued from page* 49)

Defense Plant Corp. agreement increased from $9,500,000 to $12,580,000 to provide facilities for manufacturing radial type tank engines.

Chrysler has opened a new plant for the production of aluminum alloy forgings for Martin B-26 bombers. It contains 34,500 sq. ft. and the first forgings were completed less than three months after the plant construction was begun July 28.

Studebaker Corp. has had its order for Wright aircraft engines boosted by an additional contract for $74,338,783. Ford has received a supplemental contract for $44,143,820 for 200-hp. Pratt & Whitney aircraft engines.

Nash-Kelvinator Corp. has been awarded a $15,503,878 contract for propeller assemblies and spare parts to be made in a section of the old Reo plant at Lansing. A $225,000 order for 1,028 cargo trailers also has been awarded Nash to be built at Racine, Wis. Aeroproducts Division of GM at Dayton has been awarded an $8,099,595 order for propeller assemblies. Houde Engineering Corp. at Buffalo has had its Defense Plant Corp. agreement boosted to $731,000 for producing airplane equipment.

The Ordnance Dept. recently placed the following orders for forgings: $3,506,400 to Motor Wheel Corp.; $2,284,000 to Kelsey-Hayes Wheel Co.; $880,000 to F. L. Jacobs Co., and $919,200 to Monroe Auto Equipment Co.

Recent national defense orders include $2,284,071 to Saginaw Steering Gear Division of GM for .30-cal. machine guns; $787,500 to Corbitt Co. for 6-ton trucks, $699,388 to Caterpillar Tractor Co. for tractors and graders; $695,078 to AC Spark Plug Division of GM for aircraft spark plugs; $803,204 to GM for Air Corps hardware; $633,148 to Spark-Withington Co. for bomb hoist assemblies; $356,597 to Ford Motor Co. for Navy trucks; $501,000 to Crosley Corp. for release assemblies; $187,140 to Chevrolet for trucks; 230,173 to American Bosch Corp. for magneto maintenance parts; $241,392 to King-Seeley Corp. for eliminators and valves; $277,120 to Continental Motors Corp. for engine maintenance parts; $286,200 to Link Belt Co. for carriage and recoil mechanisms; $4,888,267 to Chevrolet for ¾ and 1½ ton trucks; $5,078,370 to Willys Overland Motors, Inc., for shells; $1,242,258 to Wis. Axle Div. of Timken Detroit Axle for tank parts; $567,000 to Stewart Corp. for ground heaters.

Navy "E" Awards to Automotive Companies

Honors for outstanding achievement in ordnance production have been awarded by the Navy to a number of companies which are abreast or ahead of their contract schedules. The award permits plants to fly the Navy Ordnance flag and their employees to wear the coveted "E" button. Among concerns granted the "E" award are the following in the automotive industry, or identified with it as suppliers:

E. I. duPont de Nemours Co., Wilmington, Del.; Fisher Body Division, General Motors Corp., Detroit; Ford Instrument Co., Long Island City, N. Y.; International Nickel Co., Huntington, W. Va.; Midvale Co., Nicetown, Pa.; Consolidated Machine Corp. of America, Rochester, N. Y.; Erie Forge Co., Erie, Pa.; Bantam Bearings Corp., South Bend, Ind; Eclipse Machine Division, Bendix Aviation Corp., Elmira, N. Y.; Mesta Machine Co., Pittsburgh, Pa.; General Electric Co., Erie Works, Erie, Pa.; Bridgeport Brass Co., Bridgeport, Conn.; Ingersoll Milling Machine Co., Rockford, Ill.; Monarch Machine Tool Co., Sidney, Ohio.; Crucible Steel Co. of America, Harrison, N. J.; Vickers, Inc., Detroit; Heppenstall Co., Pittsburgh; National Forge & Ordnance Co., Irvine, Pa.; Bethlehem Steel Co., Bethlehem, Pa.; SKF Ball Bearing Co., Philadelphia; and Carnegie-Illinois Steel Co., Homestead, Pa.